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THE BRICKBUILDER.

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RETROSPECTIVE.

THE first of January has come to be associated with the turning over of new leaves and a certain amount of retrospection preparatory to a plunge into the hopes and fears which are supposed to lie before us; and though moralizing can hardly be called a branch of the burnt-clay arts or industries, by a somewhat circuitous association of ideas we are led to some reflection. This is a rapid age. Rapid transit is in the air, and not only in our streets and in our commercial structures, but in our professional life as well has the necessity for haste been made to seem to be paramount. Surely no one material has contributed more to the exigencies of haste, at least as regards the external finish of our buildings, than that which is the product of the burnt-clay industries, and the feeling of perpetual rush which is such a factor of our modern professional and mechanical life is quite as strongly felt in the particular lines of industry and industrial art which this journal represents as in any other department of human production. The old story of the artist painter who claimed that the secret of his success was that he mixed brains with his pigments is applicable to every industry which depends for its final character upon intelligence and direct, concerted effort. Now, the application of brains to the arts and sciences means time, and a lot of it. It has come to be a trite saying that we live too fast, but the necessity for deliberate thought, for making haste slowly, though ever present with us, can hardly be emphasized too strongly. There are some natures whose genius is most available at high pressure, and who need the excessive voltage to develop their illuminating power. There are other fortunate mortals who can handle fifty different enterprises at once, make a suc-

cess of each, and keep on a keen jump for years, finally going up with a shout, closing the chapter in full fighting trim. But for those of us who are just plain mortals, time is a very important and indispensable adjunct to the production of any really excellent work, though it is one which is unfortunately very often neglected. We permit ourselves to be rushed, we know full well that we do not give the cautious, deliberate thought and study to our work which we know it deserves, and we have no one but ourselves to thank for the inchoate, ill-digested aspect of so much of our current architecture. We know how to do things right, but we are too prone not to take time to do it.

The good Book tells us that no man by taking thought can add to his stature. Nevertheless we know that by taking thought we can add continually and indefinitely to our mental and artistic stature. We need at times to sit down quietly by ourselves and forget that there is a client who is in a terrible hurry to have a building done on the first of the month, or a contractor who is impatiently calling for details, and to collect our thoughts, striving to formulate our ideas and turn our problems over and over in our head until we can feel the familiarity with them which is very likely to lead to the best kind of a solution. Annie Besant is quoted as saying that if she has a very serious problem to consider, she gathers all the facts before her and then goes to sleep over them. A little more of this same procedure would give us better buildings, more systematic planning, and more artistic treatment of details; would go further, in fact, to give us what is so often sighed for and which we are but slowly approximating, — a national, distinctive style of work. Our busy men do not give themselves time for thought. We remember a short time since having a very interesting interview with one of our leading architects, who confessed to being so tired out and rushed with work that his digestion had been impaired, he was troubled with insomnia, and he felt thoroughly used up. But the stirring necessities of his practise, as he viewed them, kept him at the mill, when by rights he ought to have been out in the woods, or fishing, or doing something entirely different from his daily work, to give his tired brain a chance; and when we recall the really excellent work which he was able to turn out year after year under these excessive conditions, we cannot but think how much easier the same could have been accomplished, to say nothing of the possibility of better results, had he simply refused to be hurried, and demanded time to think and to study.

PROF. F. W. CHANDLER, who is at the head of the Architectural Department of the Massachusetts Institute of Technology, has recently been appointed official architectural adviser to the mayor of Boston. An office of this kind is not entirely new in municipal matters, but it has not been created and filled so often that there has yet been any definite precedent. Consequently, there is an added pleasure in noting the appointment. It is pleasant to think that the city of Boston has a mayor who appreciates the conditions sufficiently to admit that he does not know everything about architecture. The average city official is so seldom troubled with this kind of modesty that such an appointment is not what one would ordinarily expect, but the mayor has shown himself capable of rising above the level of the politician, and his selection is one that will receive the approval of all who are interested in good munic-

ipal architecture, properly selected and properly supervised. Professor Chandler is an eminent architect, abundantly qualified to give the best sort of advice, while at the same time his connection with the Institute removes him from the suspicion of interested advice and takes him out of active competition with his brother architects.

WE had occasion some time since to observe the construction in a building which had been in place for some thirty years, and which presented several points of interest. The floors were composed of wrought-iron beams connected by brick arches, the brickwork being laid in Rosendale cement mortar. The building was an average one, subjected to the ordinary conditions, not as good as the best and yet not especially exposed at any point. The beams rested upon brick walls laid up in cement. A careful inspection failed to show any signs of rust about any of the beams. Furthermore, the paint, which appeared to be red lead, was intact over nearly the entire surface of the iron. It is frequently asserted that cement acts as a preservative for iron or steel in construction. Lime certainly attacks the iron to a limited extent, but sufficiently so as to effect a marked change in the course of years; and plaster of Paris likewise attacks iron slightly, though we imagine the cause in this case is due rather to the extreme avidity with which plaster of Paris will absorb moisture from the air and then give it out to the iron; but whether the cement really protects the iron or not, there is every reason to believe that it protects the paint, and the paint in its turn protects the iron. Consequently if the iron beams are carefully painted before being enclosed, and the brick or terra-cotta used therewith is thoroughly bedded in cement so the cement protects the paint, there is pretty good evidence that we can safely depend upon freedom from corrosion for an indefinite period.

PERSONAL AND CLUB NEWS.

C. A. BREHMER, architect, has opened an office at 215 West Jefferson Street, South Bend, Ind. Catalogues and samples desired.

MORGAN M. RENNER, architect, has taken offices in the Hartford Building, Broadway and 17th Street, New York City. Catalogues and samples desired.

EDWARD J. DOUGHERTY and F. Dickinson Shaw have formed a copartnership under the firm name of Dougherty & Shaw, for the practise of architecture, with offices at 317 Market Street, Camden, N. J. Catalogues and samples desired.

GEORGE OAKLEY TOTTEN, JR., chief designer in the office of the supervising architect at Washington, during Mr. Aiken's administration, has resigned that position, and formed a copartnership with Laussat Richter Rogers, under the firm name of Totten & Rogers, for the practise of architecture. The new firm has taken offices at 931 Chestnut Street, Philadelphia.

THE president and officers of the T Square Club, of Philadelphia, held a reception on the evening of January 24, at the Pennsylvania Academy of the Fine Arts.

THE Chicago Architectural Club is having its usual lively and interesting midwinter season. Among the recent events were the Annual Christmas Celebration, on the evening of December 29, the first exhibition of the Projét Drawings, January 10, and the "Club Souvenir Night," December 20. Refreshments were served at each of these gatherings, a group of members acting as hosts for each occasion.

THE Annual Meeting of the New Jersey Society of Architects

was held Friday, January 7, at Board of Trade Rooms, Newark, N. J., President Albert Beyer presided; Mr. James H. Lindsley, as chairman of committee on society insignia, which was open to competition among the members, reported that the committee had selected a design which was finally adopted by the society. The code of ethics and professional practise, as recommended by the board of governors, was adopted as a whole and referred back to the committee to be incorporated in the new draft of the constitution and by-laws.

The election of officers and members to the board of governors resulted as follows: President, Albert Beyer; first vice-president, Paul G. Botticher; second vice-president, James H. Lindsley; secretary and treasurer, George W. von Arx. Board of governors, vacancies to board, three-year term, Herman H. Kreitler and Rudolph W. Sailer.

After adjournment the members were invited to partake of a collation provided by the newly elected officers.

ILLUSTRATED ADVERTISEMENTS.

THE New York Architectural Terra-cotta Company send for illustration a print of the Hamilton Club, Paterson, N. J., designed by and executed under the superintendence of Mr. Charles Edwards, of that city.

Number seven of the series of brick and terra-cotta fireplace mantels especially designed for Fiske, Homes & Co., is shown in



HAMILTON CLUB HOUSE, PATERSON, N. J.
Charles Edwards, Architect.

their advertisement on page vii, J. A. Schweinfurth being the designer.

A tympanum panel executed in terra-cotta for the public school building at Port Richmond, Staten Island, I. W. Moulton, architect, is shown in the advertisement of the New Jersey Terra-cotta Company, on page viii.

The Harbison & Walker Company illustrate in their advertisement, on page xiii, the Bank of McKeesport building, at McKeesport, Pa., Longfellow, Alden & Harlow, architects.

Number three of the descriptive series of the roofing tiles made by the Celadon Terra-cotta Company, Charles T. Harris, lessee, is given in the company's advertisement, page xxvii.

Examples of bond, showing blocks of the Gilbreth Seam-Face Granite laid up in two styles of bond, is illustrated in the company's advertisement, page xxxiv.

The American Schoolhouse. III.

BY EDMUND M. WHEELWRIGHT.

IN considering the costs of the Brighton and Brookline high schools I neglected to state in my last paper that the Brighton school is but a part of the building which eventually will be built, and that it was planned with reference to its ready junction to the future construction; it therefore has features which are adequate for the enlarged structure, and the cost per cubic foot is somewhat greater than it would have been had it been constructed of the size that it will be in the future.

To continue the consideration of the cost of schoolhouses, that of those of the grammar grade will now be considered, and incidentally certain different features of plans and construction will be pointed out.

The Pierce Grammar School, at West Newton, Mass., may fairly be considered as a fourteen-room building with assembly hall, or as having accommodation equivalent to sixteen schoolrooms. The building is of brick for two stories in height, and has an assembly hall in the roof. The schoolrooms have a stud of 12 ft. The wardrobes are in part separate rooms, shut off from the main corridor and with outside light, and in part are wire netting enclosures in the corridors. The brick walls of first and second stories are 16 ins. thick. The interior partitions are of wood studding, fire stopped and wire lathed. The blackboards are of slate. The schoolroom windows, except on one long side, the south, have double run of sash.

The ground area of this building is 11,536 sq. ft. The cubical area is 611,408 cu. ft. About one third of the attic is left unfinished, as it is space which cannot advantageously be utilized for schoolhouse purposes. The cost of this building, not including grading, fencing, and paving of the yard, and deducting architect's commission, was \$70,102, or 11 cts. per cubic foot. Reckoning the assembly hall as two schoolrooms, the cost per schoolroom was \$4,125.

The Agassiz Grammar School was built for the city of Boston before the passage of the building law of 1892, which materially increased the cost of building schoolhouses, as will be shown hereafter. This school has fourteen schoolrooms and an assembly hall in the third story. The stud of the schoolrooms is 13 ft. 6 ins. and in third story 16 ft., the assembly having a stud of 20 ft. The blackboards are of slate. The minor partitions, where not of brick, are of terra-cotta lumber. In short, the building is constructed in the main as is recommended in my earlier papers on this subject.

The ground area of this building is 9,618 sq. ft. The cubical area is 605,934 cu. ft. The cost was \$91,783 or 15 cts. per cubic foot, and \$5,736 per schoolroom.

An analysis of the reason for the differences in cost of these two schools leads to interesting conclusions.

As will be seen by the perspective sketches here given, the Agassiz School is of a more elaborate design than is the Newton school, and further, the former school has exterior walls of Perth Amboy terra-cotta brick with terra-cotta trimmings, while the latter school has exterior lining of selected Eastern water-struck brick with free-stone trimmings.

Calculations of the proportionate increase expense of schoolhouses when of architectural design, and of like buildings with the exterior features of a well-constructed factory, lead me to the opinion that the excess of cost of the architectural features of the Newton school is about \$3,000 above that of a wholly utilitarian structure serving the same ends, while that of the Agassiz School is about \$7,000. Therefore, if the design had been stripped of all architectural features, and brought to the condition of a factory building, being otherwise unchanged in its several features, it is probable that the Newton school could have been built for about \$67,000. Under the same conditions the Agassiz School could have been built for about \$85,000.

This difference of cost, \$18,000, can be almost wholly accounted for by the consideration of the difference in cost of foundations and

brickwork, together with the difference in the construction of the interior partitions and heat and vent shafts. The external walls of the Agassiz School are 19 ft. higher and 4 ins. thicker throughout than are those of the Newton school. The interior partitions of the Newton school are of spruce studding, wire lathed. The interior partitions of the Agassiz School are for the most part 12 in. brick walls, and where not of brick are of terra-cotta lumber. All the heat and vent shafts of the Agassiz School are of brick, while two of the large shafts of the Newton school have galvanized iron vents enclosed by stud partitions.

A survey of quantities of this brickwork, the cost of the Perth Amboy brick being left out of the calculation, and the exterior surface being considered as of the same material as in the Newton school, shows that these features in the Agassiz School are worth between \$15,000 and \$16,000.

Further calculation of cost of certain features of the Agassiz School in excess of features performing like functions in the Newton school account for between \$2,000 and \$3,000 of the difference of cost of the two buildings. These features may be noted in part as follows.

In the Agassiz School the basement floor was of asphalt, that of the Newton school of concrete. The Agassiz School had double run of sash in all schoolrooms, the Newton school had single run of sash upon the south side; while the former school had seven windows at least for all corner schoolrooms, the Newton school had but six.

The Agassiz School had Keene's cement door and window finish and hospital base, the customary ash finish being used in the Newton school.

We thus see that with the evidently greater cost of the external treatment left out of calculation, the difference in cost of the two buildings can be closely accounted for, and that the excess of cost of the Agassiz School is due to features which better the construction and improve the lighting of the building. It should be said, however, that \$5,000 or \$6,000 of the expense might have been saved if the Agassiz School had been built in Newton instead of Boston, as the Newton building laws would have allowed, with perfect safety, a less heavily constructed building than those of Boston permitted.

If built under the Newton building laws, and if of no more elaborate external design than that of the Newton school, but otherwise unchanged in its requirements, the Agassiz School would have probably cost not more than \$83,000; and taking into consideration the general greater cost of building in Boston than in the cities and towns immediately adjoining, we may fix the probable cost of a school of the construction and type here contemplated at about \$80,000. Hence a fourteen-room and assembly hall grammar school, three full stories in height, constructed as was the Agassiz School, but having 16 in. instead of 20 in. external walls and general exterior design and materials no more expensive than that of the Newton school, can probably be built, where the cost of building is the same as in Newton, for \$5,000 per schoolroom.

It will be interesting to compare the cost of another grammar school of nearly the same accommodations with that of the Pierce and the Agassiz Schools. To this end the plans of the Brooks School at Medford are here given.

The building has a ground area of 11,333 sq. ft. and contains 600,649 cu. ft. Upon the same basis considered above, this building cost \$60,304, i. e., 10 1/4 cts. per cubic foot and \$4,285 per schoolroom. The Brooks School is a two-story brick building with assembly hall in the roof and with twelve schoolrooms. The cost per schoolroom of the Brooks School is \$160 greater than that of the Newton School. It is to be expected that the larger the building of a given type the less will be the relative cost. We might suppose that this probable decrease in cost, about 4 per cent., or \$165, would account for the greater relative cost per schoolroom of the Medford school, but other varying conditions of the two buildings must be considered to satisfactorily understand this difference of cost. The Brooks School is of a sufficiently simpler design than the Newton school to amount to about \$50 per schoolroom of the difference.

The Brooks School has single run of sash, while the Newton school has double run on the north, east, and west sides; but the Newton school has but six windows in a corner schoolroom, while the Medford school has in such rooms seven windows. The Medford school has schoolrooms of the maximum dimensions for the grammar grade 28 by 32 ft., while those of the Newton school are 26 by 32 ft. The Newton school, however, devotes a greater proportionate area to wardrobes, since they are placed in this building as adjuncts of the schoolrooms, but enclosed by solid partitions and each having two doors,—the arrangement of wardrobes generally required in our graded schools.

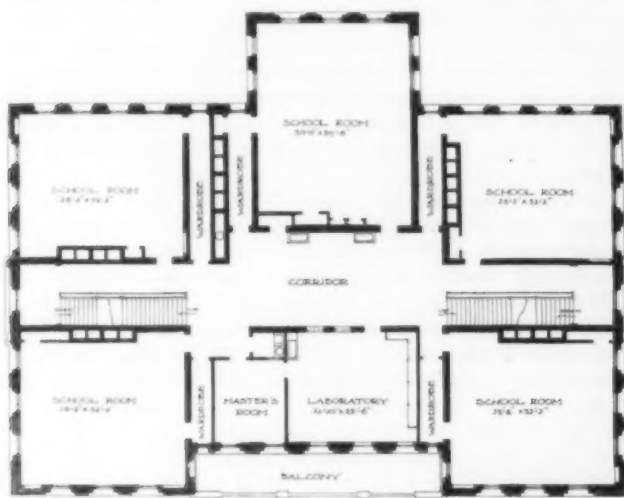
In the Medford school two large wardrobes serve on each

floor six schoolrooms. The wardrobes are practically a part of the corridor, but are arranged with more ample vent ducts than are usually provided for corridor wardrobes. The schoolrooms in the Medford school have a stud of 13 ft., and the stud of the schoolrooms in the Newton school is but 12 ft. There is, however, about the same amount, relative to the size, of foundations and exterior brickwork in each building. The Medford school has wooden-lathed ceilings above basement, and the Newton school has wire-lathed ceilings throughout.

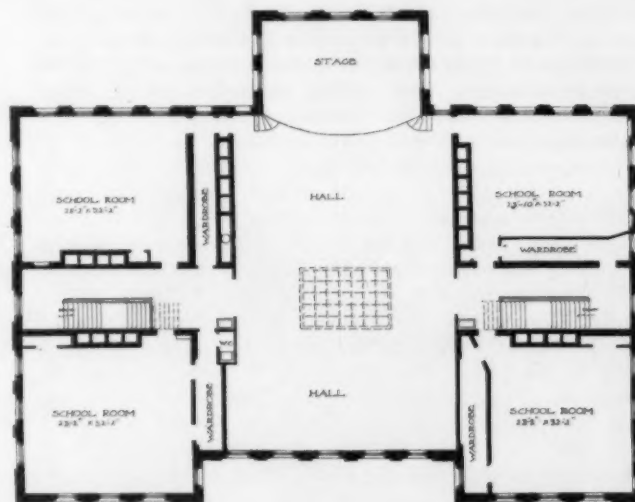
From the foregoing comparison of costs we may credit the Newton school with about \$210 per schoolroom; but as we have debited it with \$165 on account of its size, we have yet to discover



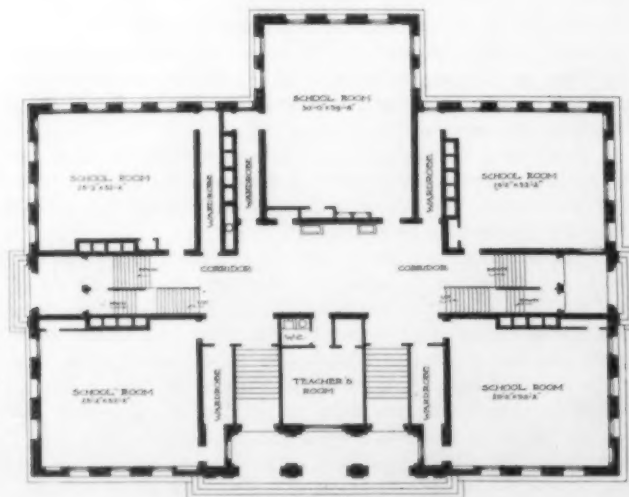
AGASSIZ GRAMMAR SCHOOL, BOSTON, MASS.
Edmund M. Wheelwright, City Architect.



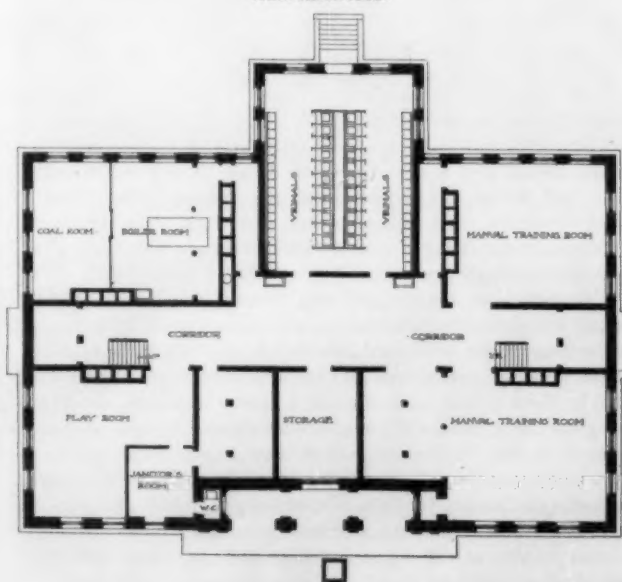
SECOND FLOOR PLAN



THIRD FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT PLAN

AGASSIZ GRAMMAR SCHOOL, BOSTON, MASS.

the reason for the difference of cost of the two schools. Examination of the plans of the Medford school will show, however, that there are elements of cost which more than account for this apparent discrepancy. In both schools the basement partitions are brick, but the bearing interior partitions in the Brooks School are also all of brick or steel columns and beams, while those of the Newton school are spruce studding; and in the Brooks School all the heat and vent shafts are brick, but in the Newton school two of these shafts are of galvanized iron cased in stud partitions. It is evident, by the sufficiently accurate calculation of the relative cost of these different forms of construction, that the greater expense per schoolroom of the Brooks School

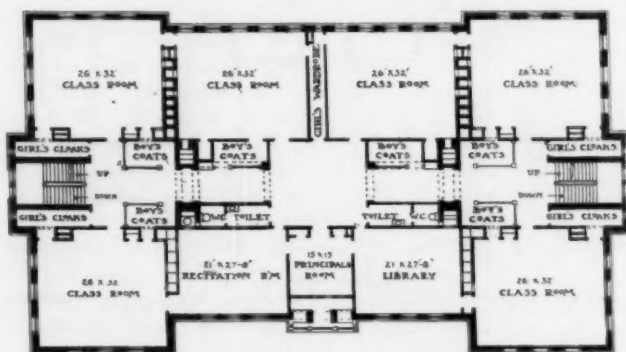
embodied in the structure. As the partitions and floors of the Newton school are fully protected by fire-stops and wire lathing, and as all the basement partitions, as in the Medford school, are of brick, the chief practical disadvantage in having the bearing partitions of studding is the probability of trouble from shrinkage. In cases

where interior brick walls involve too great expense the light steel bearing partitions covered with wire lathing and cement, which have lately come into use, while somewhat more expensive, are certainly to be preferred to partitions of wood studding, even when they are wire lathed and fire-stopped. Certainly in a schoolhouse no bearing partition should be constructed without fire-stops. We have fixed at \$80,000, or

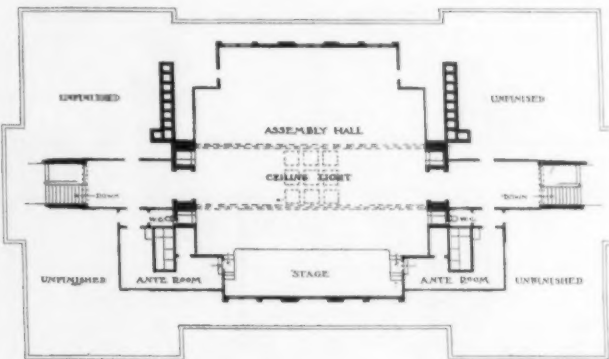


PIERCE GRAMMAR SCHOOL, WEST NEWTON, MASS.

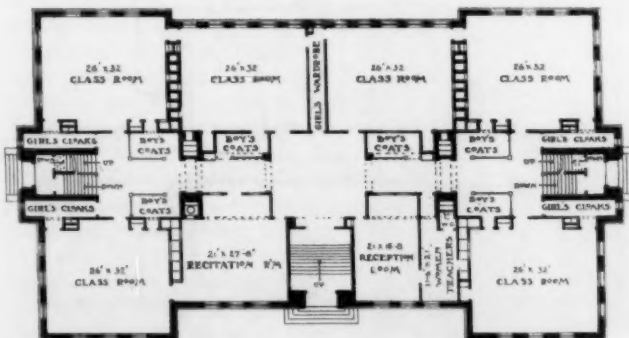
Stickney & Austin, Architects.



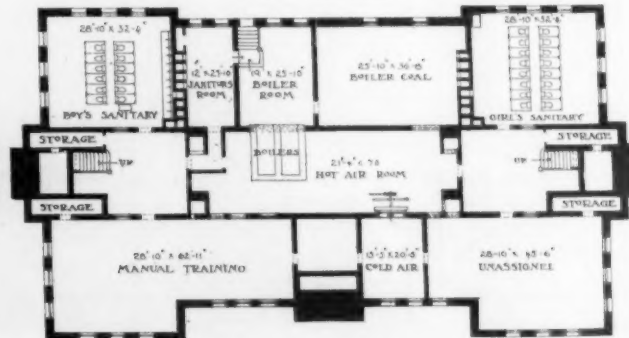
SECOND FLOOR PLAN



THIRD FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

PIERCE GRAMMAR SCHOOL, WEST NEWTON, MASS.

is caused by the interior brickwork which the Newton school lacks. The Brooks School, as a result of the consideration of all these factors of cost, presents a relative advantage of economy over the Newton school of about \$50 per schoolroom, which may in part be ascribed to the possibly less general cost of building in Medford than in Newton.

The architects of the Newton school would have preferred to have used the more solid construction adopted in the Medford building, but the necessity of meeting within a limited appropriation the fixed requirements of the buildings precluded the possibility of this construction if other and possibly more essential features were to be

\$5,000 per schoolroom, the normal cost of a building of the type of the Agassiz School, when given no richer external treatment and no thicker brick walls than the Newton. Why is it, then, that the Brooks School, a smaller building, and hence, other things being equal, normally more expensive per schoolroom, costs but \$4,285 per schoolroom?

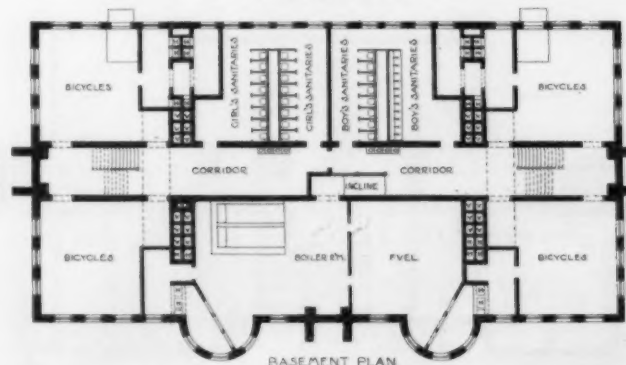
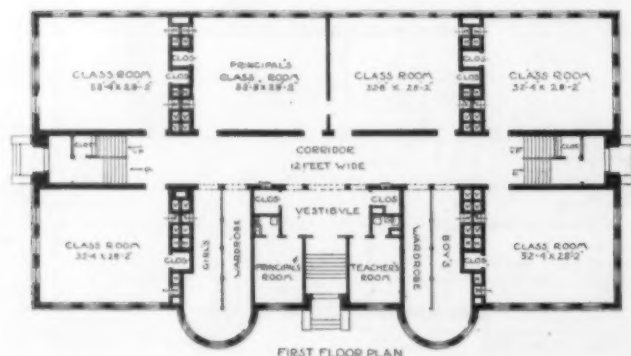
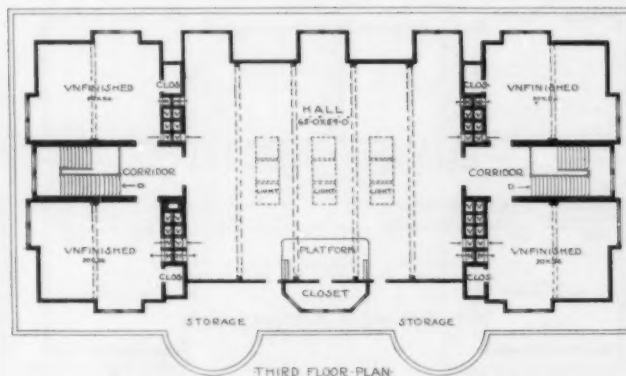
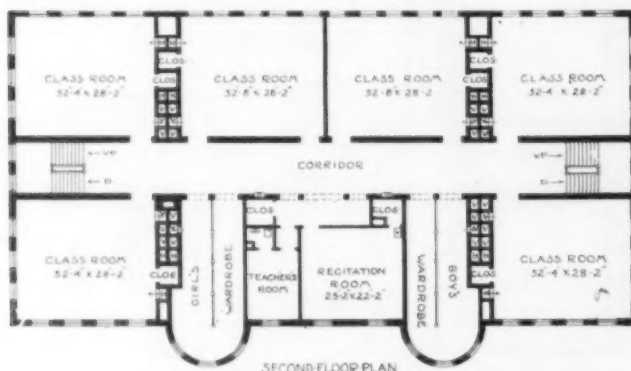
Of this difference in cost of \$715 per schoolroom we can account for about \$150, by taking into consideration the more expensive external treatment predicted for the Agassiz School, together with certain features noted earlier in this paper, which, while desirable, are more costly than the substitutes used in the Brooks School. Further,

the Agassiz School has 19 ft. greater height from basement floor to top of exterior brick walls. The interior partitions are brick or terra-cotta lumber, while in the Brooks School the carrying partitions only are of brick and the others are of ordinary wood studding. The arrangement of separate wardrobes adjacent to schoolrooms given in the Agassiz School increases the amount of partitions and the number of doors, as well as adding to the proportionate area of the building. The Agassiz School has



BROOKS GRAMMAR SCHOOL, MEDFORD, MASS.
Wales & Holt, Architects.

cost due to the larger size of the Agassiz School. This is, as noted above, about 4 per cent. for each additional pair of schoolrooms, amounting in this case to \$190 per schoolroom. There stands, then, to the credit of economy of construction of the Brooks School above that of a building of the type of the Agassiz School, constructed under the assumed conditions, \$155 per schoolroom; *i.e.*, the Brooks School would appear to have been $3\frac{1}{2}$ per cent. less expensive than the hypothetical building with which we have



BROOKS GRAMMAR SCHOOL, MEDFORD, MASS.

double run of sash in all schoolrooms, while the Brooks School has single run only; the former school has first floor of mill construction and wire lathed in the upper stories. The Brooks School has wood-lathed ceilings, except in basement, where the ceiling is wire lathed.

An estimate of the difference of cost due to these differences in construction shows that the Agassiz School cost \$600 more per schoolroom on account of these features.

Adding these to the difference of cost found above, we find that there is to the credit of the hypothetical Agassiz School now under consideration, \$35 per schoolroom.

We have not yet taken into account the percentage of lessened

compared its cost, while giving credit for value to be received in the school of the Agassiz type, as above considered, from the features of plan, construction, and detail, which will be recognized as desirable when they can be afforded.

It might be possible by closer comparative survey of quantities and closer study of other conditions to account satisfactorily for this slight difference of cost. This appears, however, to be unnecessary. The result attained, taken with the preceding analysis, sufficiently demonstrates that the cost of schoolhouses, where designed by skilled architects, depends upon the demands of the clients in regard to plan and construction.

Architectural Terra-Cotta.

BY THOMAS CUSACK.

COOPERATION BETWEEN ARCHITECT, ENGINEER, AND CLAY-WORKER.

IN that branch of the main subject on which we have recently been engaged, the use of steel as an auxiliary support has received some attention. It has, of course, been viewed chiefly from the standpoint of the terra-cotta manufacturer, but without prejudice to the allied interests involved. An effort has been made to facilitate the whole process of execution by avoiding cumbersome or needlessly complicated methods of construction. It is by adopting simple expedients, and by using the most readily obtained or easily made appliances, that we get a maximum stability at a minimum cost. We shall endeavor to illustrate this general proposition in greater detail, as heretofore, by the help of typical examples taken from current practise. The connection between steel and terra-cotta in its widest sense, however, may now be reviewed as a useful preliminary to a purely technical discussion of the several branches of our subject.

While the introduction of the steel frame gave an undoubted impetus to the use of terra-cotta, it did not in anywise tend to lessen the numerous exigencies already incident to its manufacture. With an increased demand, and a very alluring vista of possibilities, there came peremptory calls for unfamiliar, if not impossible, shapes and sizes. Coupled with these came new-fangled notions of attaching them to the skeleton, which, when not altogether visionary, were often rather perplexing. Methods and maxims which had withstood earlier vicissitudes, and whose existence hitherto was obviously a survival of the fittest, were soon at a discount. The ways and means that had been sufficient in a modest, self-supporting class of work were no longer adequate under new and more exacting conditions. In fact, the business that followed was to some extent a new one; and, being greatly increased in volume, the ranks of those engaged in it became filled with men of necessarily limited experience. This also, for a time, placed the terra-cotta manufacturer at an additional disadvantage. Hitherto he had been able to discuss and determine all questions with the architect; who, in view of the points involved, would usually agree to any well-considered alternative that might be proposed in jointing or otherwise. With the advent of an independent skeleton, he soon found that a new terror had been added to his already onerous existence. The architectural engineer—a veritable man of iron—had now to be reckoned with.

This last-named gentleman was also a new, but very necessary, element, though at first—and we think with great injustice—considered one of doubtful import. He has been called an intruder, a Philistine, and, cruelest cut of all, a man “incapable of esthetic emo-

tions.” During the early years of his existence he received scant recognition, more especially from such as could not brook a rival near the throne. The first of these allegations has been abundantly disproved, and for the other two, he seems to have allowed judgment to go by default, as he could well afford to do. In reality he is but a product of altered conditions, possibly a little forced as to time, but withal a perfectly natural growth. There was a place for him; and, perhaps, owing to his training in that regard, he managed to find it without undue effort on his own part. Whether acting in a purely professional capacity, or in the dual rôle of contracting engineer, we have, in the course of business, had many opportunities of detecting flaws in his armor. There have been differences of opinion, arising chiefly from the different points of view, but on no occasion has there been reason to question his credentials, or regard

him as other than a friend and a brother. We shall have to take issue with him presently on certain points wherein he has at times shown a lack of consideration for men and things other than himself and his belongings. This, however, will be done in good faith, and with the respect due to a coworker.

A basis of agreement between architect, engineer, and terra-cotta manufacturer, on which mutual help may be rendered, is suggested by the interdependence of the two materials called into service in every operation on which they happen to be conjointly engaged. While each of them is serviceable, and, to some extent, necessary, neither of them is absolutely indispensable. They have widely different duties, it is true, but their several performances are part of a complete whole; the more perfect when performed in conjunction rather than isolation, in agreement rather than discord. Thus, if terra-cotta has in some cases to be re-enforced by iron, so, also, and to a much greater extent, is the skeleton dependent upon the clothing with which it is made presentable. Deprived of this protection, its existence would be imperiled by atmospheric action. By such protection, and by it above all others, if not by it alone, may the structure be rendered invulnerable when attacked by fire. The analogy holds good, and applies with equal force to the relationship existing between men whose business is to make the best composite use of these increasingly popular materials.

The advantages of consultation and cooperation such as that on which we are about to insist must be apparent; yet we are not sure that the importance of that line of procedure is so generally recognized and acted upon as it ought to be. The need for a common understanding is, we believe, conceded on all sides as an abstract proposition; but its application in every-day practise is too frequently overlooked, and if not altogether forgotten, is sometimes resorted to as an afterthought, in the hope of surmounting consequent exigencies that need not have arisen. Theoretically, our proposal is not a new one, but we would give it a new reading, encourage its development, and make it more of a tangible reality than heretofore.



FIG. 48. THE DUN BUILDING, NEW YORK CITY.
Harding & Gooch, Architects.

So far as this plan has been tried the results have been reassuring, and encourage the belief that it is the logical outcome of existing conditions. Cumulative and confirmatory evidence as to this could be adduced by citing the favorable opinion of leading architects in support of it; but it is hardly necessary to add such indorsement to that which is not likely to be seriously contested.

It may be opportune to note at this juncture that the examples of steel and terra-cotta construction selected for illustration in *THE BRICKBUILDER* during the past year were the result of consultation, concession, and mutual agreement. They do not, for instance, represent the individual opinion of any one man, but may be considered the embodiment of the best possible advice made by, or accepted by a number of men, each one something of a specialist in his own particular line. It is to this fact, no less than to the actual test of service, that they owe whatever of interest or value they may be said to possess.

the flange of a cast-iron lintel in the manner shown in section at *A*, Fig. 49. The terra-cotta voussoirs were of sufficient depth to be self-supporting, and were not obliged to depend on these iron lintels. Had that not been so, however, the insertion of this flange at the point indicated would have been a doubtful expedient. It is placed too high, and enters so far into the block as to become a source of weakness. The voussoirs, being deficient in tensile strength, would have had a tendency to crack from chance knocks or unequal pressure at this, their weakest point; in which case the portion suspended below and not resting on the flange would have had no support whatever. This objection having been pointed out to the architects' representative, the cast-iron lintels were at once modified to the extent shown at *B*, Fig. 49. This apparently unimportant change was an undoubted gain in the strength and security of the terra-cotta arches, with rather less expense on the part of the iron contractor. On the

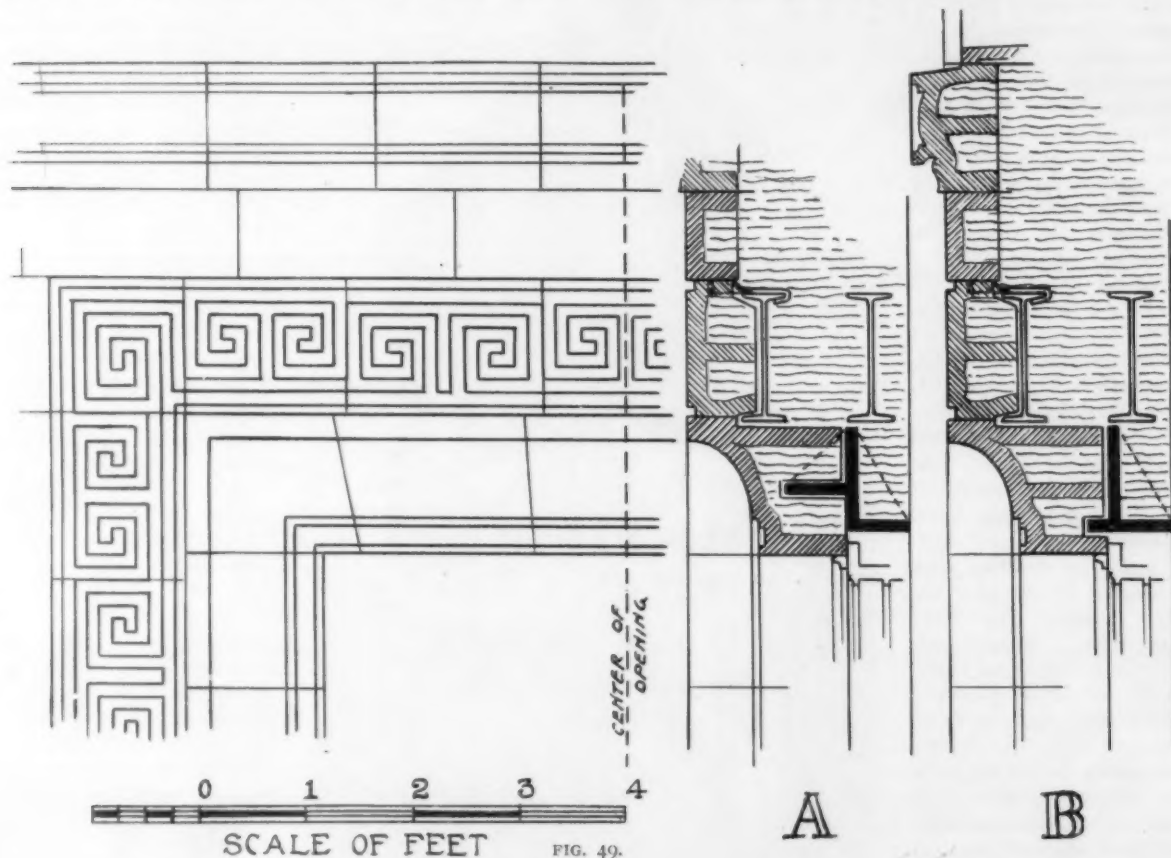


FIG. 49.

At Fig. 48 we have an advanced type of the steel frame with terra-cotta and brick walling in process of erection. Here, too, the several interests referred to have contributed something towards the sum total of its maturity, as it emerges from below the sidewalk, rising rapidly into space. At the date of writing it is nearing completion, the very substantial envelope of terra-cotta having proved a remarkably good fit for its anatomy of riveted steel. The skeleton had reached its full height before any of the terra-cotta had been set, and similarly, the manufacture of the latter was being advanced while most of the former existed only on paper. This made it incumbent on all sides that the points of contact between the two materials should be predetermined with the greatest accuracy, and adhered to in the execution of each from start to finish. The methods of attaching them had not been settled beyond recall when the contracts were closed, but were ultimately—within reasonable limits—based on the advice or concurrence of those who were responsible for the due performance of that duty.

We know of a building in which it had been proposed to insert

whole, we think there has been no reason, here or elsewhere, to regret the introduction of the principle for which we are contending.

In the practical application of this process of adjustment an occasional hitch may occur on small questions of precedence and priority, etc., but a little time and patience will bring about the needful assimilation, and the force of circumstances can be relied on to regulate conflicting ideas, where other influences appear inadequate. If the parties concerned are actuated by an honest desire to obtain the best possible solution of a given problem, they will not throw away time or thought upon trifles, but welcome the wisest suggestion to that end, without much regard to its parentage or antecedents. Good ideas may be, and, indeed, have been damned by faint praise; they may suffer a temporary eclipse at the hands of those who do not understand, or are prejudiced against them; but if sound and practicable, whatever their origin, they usually command a respectful hearing, and in the end cannot fail of adoption. Meanwhile, few will deny the validity of the words attributed to the wisest of men: "In a multitude of council there is safety."

REPORT OF THE COMMITTEE ON ARCHITECTURE AND GROUNDS OF THE TENNESSEE CEN- TENNIAL EXPOSITION.

THE report of the Committee on Architecture and Grounds of the Tennessee Centennial Exposition, a portion of which is herewith presented through the courtesy of Mr. Ernest Flagg, a member of the committee, is of interest to those who have visited Nashville as well as to those who know of the buildings only in a general way. Intelligent criticism of architectural work is seldom obtainable, and honest expression of educated judgment, free from either lavish condemnation or indiscriminate praise, should always be welcomed. The report considers the buildings and the grounds in a perfectly impartial light, and the conclusions are logical, and based upon sound principles of architectural taste. If our public buildings were more often criticized in this same way the profession would be a vast gainer thereby.

GENERAL REPORT ON BUILDINGS AND GROUNDS.

In all great expositions the chief exhibits are the buildings and grounds. These are more in evidence, more seen and commented on than all the rest besides, and upon their success or failure in fulfilling their functions must hang, to a great extent, the fortunes of the enterprise. These functions are twofold, esthetic and practical. Their beauty should attract multitudes to see them, and they should tend to elevate and improve public taste. They should be arranged so as to display the exhibits to the best advantage, and as far as the means will permit, the buildings should themselves be an exhibition of modern methods of building of the most advanced type as regards construction, materials, and design.

The grounds should be laid out with a view both to convenience and beauty. They should be planned to preserve the natural advantages of the site, if any, to serve as a setting for the buildings, and to facilitate communication between them.

The buildings and grounds are necessarily so closely connected that one cannot be intelligently planned independently of the other. They each form a part of a general ensemble, the plan of which should be laid out and controlled by one mind.

In judging of the present exposition, it is necessary to take into account the financial limitations and the other difficulties encountered in carrying out the work. It is not always possible to realize the ideal, however distinctly conceived, with unlimited means at command. It is still more difficult, if not impossible, to do so when, through inexperience, no correct ideal exists in the minds of those in charge of the work, and the means are limited. In the present case it was extremely unfortunate that no competent supervising architect was employed as director of the general scheme of the buildings and grounds, and it was unfortunate that the plan which was adopted should have been interfered with and injured by the demands of certain of the exhibitors and by local interests.

While candor compels one to admit that the general effect of the exposition might have been greatly improved by a more skilful disposition of the parts (as will be indicated hereafter), yet the plan was so far successful as to give general satisfaction to the majority of visitors.

The site is a fine one on the high land to the southwest of the town, toward which it slopes, so that from all parts of it there is a fine view of the city. Any view of Nashville is interesting, and from no place more so than from the exposition grounds. The capital city is dominated by the Capitol Building, which stands upon an eminence in its very heart, its base being well elevated above the roofs of the surrounding buildings. The central axis of the exposition was made to coincide with the main transverse axis of this building. It was a very happy thought to place the chief building of the exposition upon this axis. The other buildings of the group were, in general, placed about it so as to enclose an irregular quadrangle, having a broad opening in the center of the side toward the town. This opening was occupied in part by an artificial lake of irregular

outline, spanned at its narrowest point by a bridge, an imitation of the Rialto at Venice, also located on the main axis. Here, evidently, was the place for the main approach, and here it appears to have been placed in the original plan. If this plan had been carried out, nothing in the way of an approach could well have been finer; but local interests interfered, and the scheme was abandoned. Nor was this the only detrimental change in the original plans. Buildings were allowed to encroach upon the quadrangle in such a way as to almost completely destroy its effect. Thus, instead of a grand entrance, as originally intended, by a broad avenue connecting the exposition and the town, located on the main axis of both, the approach was relegated to a corner of the grounds, and the quadrangle was cut up and disfigured by buildings, generally the poorest of the group, placed without regard to the others; so that upon entering the grounds one would never suspect that there had been any preconceived general plan, but rather would suppose that the buildings had been placed about at haphazard. So completely was the first plan damaged by these unfortunate changes, that it was only from the bridge that one could understand what the effect might have been.

If we consider the general appearance of the buildings themselves in relation to one another, one cannot but regret the difference in scale between them, and the irregularity of their placing. If the simple expedient adopted at Chicago, of keeping their main cornices at the same level, had been used here, the general effect would have been far more harmonious, and if the lines of the great quadrangle had been laid out with regularity so that its sides were parallel, and the buildings in line, there would have been a decided gain in dignity, and in the simplicity which always accompanies it. The effect of the group might also have been improved if the Parthenon had been placed farther back, that is to say, to the southwest, which would have given it greater importance, as there would have been more space in front, and a finer approach. Moreover, the very inharmonious effect of the Commerce Building as a background would have been avoided.

The chief feature of the exposition, and the one which will make it memorable, was the full-size restored model of the Parthenon at Athens, just referred to; a copy in plaster of the exterior of the greatest work of art the world has ever seen; a monument which will doubtless ever stand as the highest achievement of the handiwork and taste of man. Though in the nature of things this model was scarcely more than a scenic reproduction of the glorious Athenian temple, it served better than a description or drawing could to give the beholder an idea of the original appearance of its exterior. Though constructed of flimsy material, of imperfect workmanship, and in the midst of uncouth and inharmonious surroundings, this model was beautiful beyond the power of words to express. Who, that saw this poor shadow of the original building, has not asked himself, What must the building itself have been, when it stood in its perfection the shrine of the goddess, with its incomparable setting on the Acropolis of Athens, surrounded by masterpiece of Grecian art, constructed of the great blocks of purest Pentelic marble, filled together with a perfection of workmanship surpassing the skill of modern times to imitate, alive with statuary of such exquisite beauty that the very battered fragments which have come down to us serve as the criterion of plastic art? What has the world not lost in the destruction of this pile?

Having seen the exterior, one could not help wishing that an attempt had been made to complete the model by restoring the interior also. This might have been accomplished with little loss, for as an art gallery (for which it was used) it served the purpose only fairly well. It did not lend itself happily to such usage. The light was too feeble and too high, and the wall surface of limited extent, so that many of the pictures were skyed for lack of space.

Although comparisons are odious, one may say, without injuring the feelings of the most sensitive, that this model of the Parthenon, imperfect though it was, was immeasurably superior to any of the other buildings of the group. Its simple majesty and masculine

beauty dwarfed them into insignificance, but their presence was annoying; one could not help wishing for a view of this extraordinary structure without their disturbing influence, and it is much to be hoped that the model may be preserved for a time, at least, after the other buildings are removed, so that it can be seen by itself.

As a lesson in art it ought to serve a very precious purpose. Who can look at it and not blush for the art of the nineteenth century? Who can look at it and not wish that we Americans might emulate the ancient Greeks and produce an art of our own, and a national style that might vie with theirs?

It is believed that the prototype of the Grecian Doric order is to be found in Egypt, and doubtless this is true. An architectural style cannot be created offhand, it is invariably the result of evolution, depending for a basis upon what went before, and developed by countless minds working in unison through the ages, rising or falling in artistic excellence with the taste of the times. We have no na-

based on common sense; where they may receive instructions from the foremost men in the profession, just as the architectural students in the great French School of Fine Arts receive their instructions from the foremost practising architects of France.

An excellent illustration of what has been said is furnished by the building represented by the Parthenon model and the Auditorium Building of this exposition. The Parthenon model represents a building built twenty-five hundred years ago, which, at the time it was built, was the very personification of reason, and the highest development of the modern art of the times; every feature tells its story, every detail is fashioned in such a logical way to serve the purpose for which it was designed, that any one can see its use, and follow the beautiful working of the mind that designed it. With such simplicity are the parts assembled that a little child can understand their meaning, yet with such skill that the most impassive soul must be moved to awe and reverence as he beholds its sublime beauty,



TENNESSEE CENTENNIAL EXPOSITION.

This illustration is made from a lithographic print, issued by the management, and is intended only to give a general idea of the grounds and buildings.

tional style, we copy whatever suits our fancy, and make little progress in art, for we are working at cross purposes.

The lesson which the Parthenon teaches, if we understand it aright, is this: That good art must be modern art. No work has ever retained a lasting reputation as a masterpiece of art which was not modern, and in the style at the time it was made. And no such masterpiece has ever been created which did not belong to a great art epoch. Masterpieces are not isolated productions. They can only be created when the whole artistic feeling of a race has been elevated to a high plane. If art is to reach a high plane here, the growth must be along healthy and natural lines. We will not reach it by copying the works of others, even though they be the Greeks. Our art must be based on reason, that is, it must call into play the highest faculties with which we have been endowed by the Almighty. We must think. The forms must be adapted to the materials used, the purpose for which they are used, and to the mechanical methods used. The Greeks worked in this way, and so have all other people who have achieved distinction in art. In architecture, our crying need now is for a national school, where our young men may be taught how to think, and to understand that good design must be

its calm dignity and perfect repose. On the other hand, let us in all kindness examine the Auditorium Building. Is there anything about its exterior to express the purpose for which it was intended, the method of its construction, or the nature of its plan? From the outside it appears to be a rectangular temple with a square tower piercing its center. Inside it is an oval apartment, and the tower has disappeared. Outside it indicated stone construction, for the forms of the moldings and other details are adapted to stone construction. Inside we find it is built of wood. Outside it appears to be a building of the debased art of the sixteenth century; inside it appears that it is a temporary wooden building of the nineteenth century. Is this logical? Could the Parthenon ever have been produced among people who employed such methods? Can good art ever proceed from falsehood? If we have an auditorium to build in wood for an exposition of the nineteenth century, why should it not appear to be what it is? Why do we not use the material at hand in a natural way, adapt the forms to the materials, and make the outside tell the story of the inside, letting it frankly appear as a building of the present day? What is there to be ashamed of? To expect a good result with the methods of design and construction

used here would be as senseless as it would have been for the builders of the Parthenon (supposing they could have done so) to have designed the Parthenon to represent an auditorium for a fair of the nineteenth century, and then expect it to be successful as a temple to an Athenian goddess. The same thing is true to a greater or lesser degree of all the buildings of the exposition. The designers are not so much at fault as the taste of the times. They did the best they could according to their lights, and did they not have the illustrious example of the Chicago Fair before their eyes to lead them astray?

Let us hope that a new epoch will dawn, that the time will come when we may design our expositions in the light of reason and common sense; when, profiting by the example of the French, we may seek to make the buildings mean something, as illustrating modern methods of construction, and the use of the new materials which are being almost daily placed at the disposal of the architect by modern science, and also illustrating modern design suited to the present requirements.

When that time comes, we shall be on the high road to a national style, a style adapted to modern wants, and we shall be on the high road to good art, the same road trod by the ancient Greeks, which made the Parthenon possible, and the Greek name a synonym for art.

REPORT UPON THE BUILDINGS IN DETAIL.

Considering the buildings, then, not as structures which speak their function in the character of the exterior, but as examples of composition along classic lines, it is interesting to refer to a few details.

Many of the designs show schemes of composition that would, with study, produce excellent results. The Government Building is probably the best on the grounds, after the Parthenon, and it is to be regretted that its effect was marred by its surroundings. Its general proportions were pleasing, and its details simple and good; the segmental ends terminated the building gracefully, and were in harmony with the central dome. The dome, however, may be criticized for its heaviness and dry outlines, and it is not easily understood why such awkward pedestals should have flanked the main entrance.

In the Commerce Building, especially, has a noble scheme been poorly carried out. While its general grouping was one of the best, the central motif was confused, the first story flat, and the pediment sculptures inadequate. The dome with glass enclosures produces a flimsy effect, and the corner pavilions were badly cut horizontally.

The Hygiene Building had an excellent porch, but the doors behind the columns were too contracted and the sculpture masses against the sky too slight. This is better than the Commerce Building, however, in that it is less pretentious.

Again, in the mass the Negro Building, the Machinery Building, and the Agricultural Building were pleasing, the first perhaps the best of the three and most festive, although the central entrance was too diminutive, and the cross-bar filling to the openings overdone. The second was small in scale, but the high-up windows afforded excellent wall space for exhibits. Of the third, the lack of simplicity is the chief criticism; at one and a half the size the parts would not be so crowded. Many of its individual parts are excellent, and the exterior conforms to the arrangement of the plan.

The History Building and the Children's Building were smaller than the others, and very attractive. In the former, the portico, which we suppose is a copy of the Erechtheum, was gracefully comprehended, and in the latter the composition was very well expressed, although the ornament was of an inferior character.

The Auditorium, already mentioned, was, with perhaps one exception, the least attractive of the buildings; its lack of harmony in plan and exterior, and the absurdity of the tower over the center of the assembly room are in keeping with the awkwardly arranged corners and the unstudied details.

The exception referred to is the Women's Building. It scarcely seems possible that columns could be so clumsily designed, that they could be made to support so ridiculous a cornice, and that any one

should think of crowning such a building with a temple, the absurdity of whose scale is only equaled by its function as a roof garden.

The Minerals and Forestry Building, the Horticultural and Transportation Buildings scarcely call for mention.

It is a pity that the Memphis Building should have had so important a place; its color, form, and details did not in anywise warrant it.

It was a happy thought that provided so much green lawn, and it was a kindly summer that kept it green. Great credit is due to the gardeners who laid out the trellises and the flower beds. The radial design at the end of the Forestry Building, and the hanging vines in the basin of the Water Nymph Fountain were most charming.

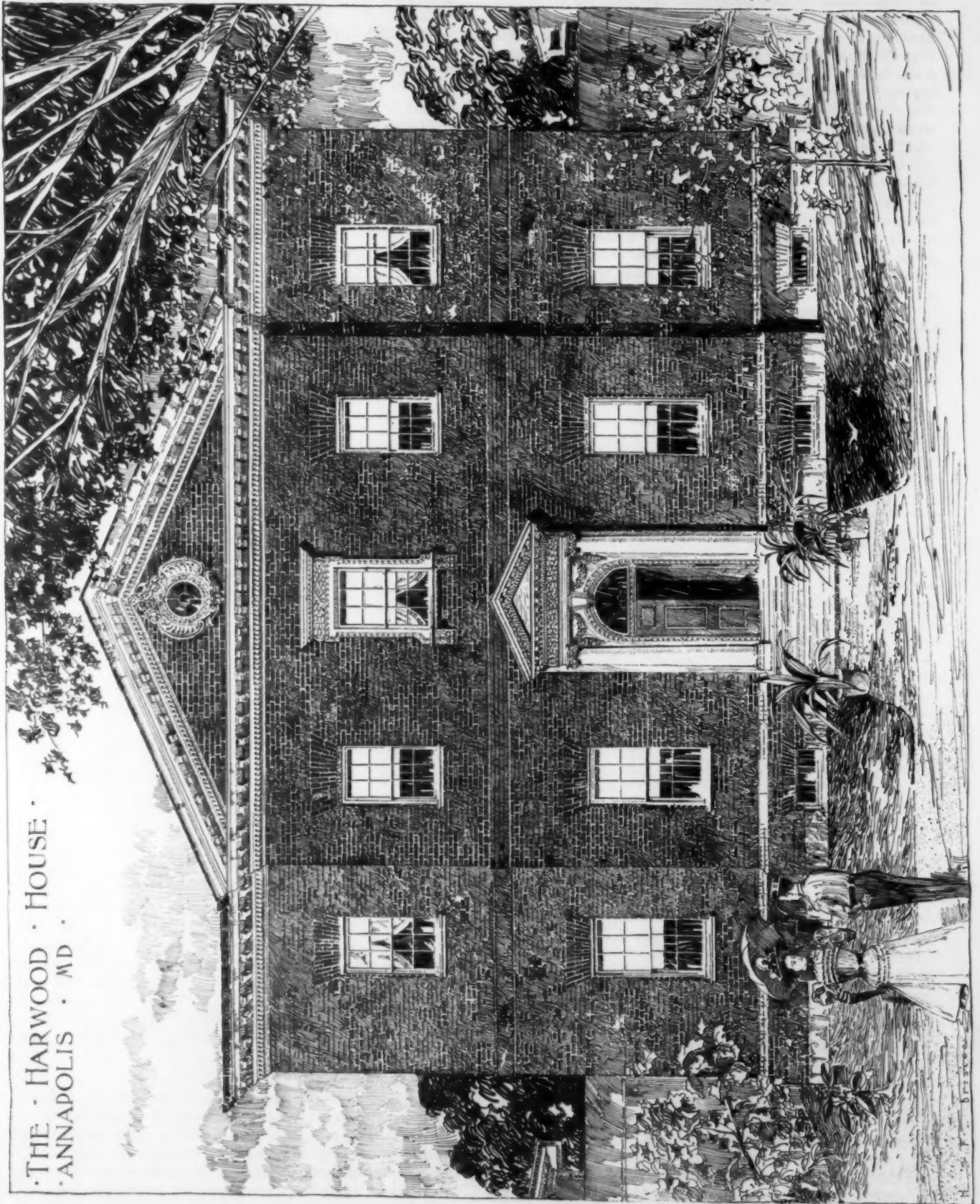
THE DISINTEGRATION OF CLAY BY FROST.

THERE are many experiments to prove that water expands in the act of passing into ice. It may be useful to briefly describe one of these; then, when we come to the application of the principle to the disintegration of clay, it will be plain sailing. An experiment, which might be termed classical, was performed by Major Williams at Quebec. He took a 12 in. shell and filled it with water, closing the orifice with a wooden plug. He then exposed it to the open air, the temperature of which was, at the time of the experiment, 18. degs. below zero (Fahrenheit). The consequence was, that when the water froze the plug was driven to a distance of about 100 yds., and through the orifice there immediately came an icicle 8 ins. in length. The bulk of this icicle, of course, represented the amount of expansion. In another case the shell itself was rent, and a sheet of ice came through the crack. This evidently settles the case of the bursting of the water-pipes. Indeed, the very fact that ice will float on water shows that water expands in freezing. It may be mentioned, by the way, that all liquids do not behave like water in solidifying; for while on the one hand we have ice, bismuth, and cast iron contracting as they pass into a liquid, on the other hand we have mercury, phosphorus, paraffin, and spermaceti contracting as they pass into a solid.

The effect of freezing water on rocks may be seen in quarries, in the weathering of cliffs, and in the production of landslips. If the rocks are not very porous, plenty of water will still find its way through them by means of cracks, and on the freezing, and consequent expansion, of this water there will be a dislodging of blocks of rocks, sometimes of great size. This disruption of the rock by frost is, of course, of great utility sometimes, and is accordingly taken advantage of by the quarrymen. In very porous rocks, however, the tendency of frost is to crumble and disintegrate them. When, for example, a stone full of its "quarry water" is exposed to intense frost, it will often fall to pieces.

There can be no question that the exposing of the clay to the open air, and its consequent weathering for some months, is of distinct benefit to the clay. Some brickmakers, however, seem to think that it is hardly worth while to let the clay ripen in this way, and accordingly they use it freshly dug, contending that "the weathering of clay is of no real benefit to the finished article, but will only lessen the labor and expense of mixing and preparing the clay before use." With this statement we cannot agree at all, for the exposure of the clay to the weather has a twofold effect, both tending to improve the quality of the clay, and thus to benefit "the finished article."—*British Clayworker*.

THE first half of the last century was rather remarkable for the development of the brick and tile industry. At Mount Vernon, for example, which was built in 1734, a curious variety of plain and molded bricks, paving tiles, and copings is still to be seen, and examples of molded brick water-tables and of floor-tiles, both square and octagonal, dating from the same period, are still quite numerous in the Eastern States.—*American Architect*.



Fire-proofing.

MR. HOWARD CONSTABLE, in a recent address before the Boston Society of Architects, made the statement that he believed he could with cement construct a fire-proof floor which would be equal to the best terra-cotta construction, and, on the other hand, he could with terra-cotta make a floor fully equal to the best construction of concrete. We would not carry the comparison quite as far as Mr. Constable, or even hardly to the extent of admitting that either proposition represents entirely our personal belief, as we have yet to be convinced that any material has as yet been suggested and put on the market which can hold its own, after fair, impartial tests with terra-cotta; but we interpret his statement as implying that in the present state of the market and of the science, the value of fire-proof constructions lies very largely in the details, and that the success of any application in this direction is measured not unfairly by the ease with which it can be adapted to practical exigencies and made readily available in the hands of the ordinary workman. We have repeatedly emphasized the necessity for increased attention to details. Terra-cotta undoubtedly has the large lead over anything else at present offered for the protection of steel in a building, and its efficacy has been tested in the very best manner, that is to say, in constant daily practise, but it will not do for our manufacturers of fire-proofing material to feel that the last word has been even suggested. The principle involved in the use of terra-cotta is admittedly a correct one, but in order to insure the best results we need not only the proper material, but its proper application, a proper variation of its employment for specific cases, while beyond this there must be a constant attention to matters of pure arrangement and plan. It is not fair to build a structure in such a way that a slight conflagration can develop the heat of a blast furnace, and then complain if the fire-proof material yields. We would admit at the very start that under certain conditions nothing is absolutely fire-proof. Therefore, if we wish to have fire-proof buildings, we must have not only the fire-proof material, must not only use it in the best and most advantageous way, but must so plan our structures that the inertia of conflagration, which is a very large element of danger, can be checked at the very start; and though the chief reliance can be upon the protection of the steel skeleton, the building as a whole must present decided obstacles to the spread of a fire, even through its contents. It is safe to say that in no building where these principles were fairly considered has the terra-cotta ever been found wanting. The cases where it has failed to give efficient protection are those wherein the details were either improperly considered in manufacture or were not thoroughly carried out in execution. A workman laying terra-cotta skew-backs along a built girder, for instance, is quite as likely as not to disregard any inequality in the metal, such as splice plates, stiffening angles, etc., and make up for that irregularity by such cutting and so called fitting of the blocks as would weaken them and cause them to fail at a critical time. We have known an instance of terra-cotta arches between steel beams which were put in place in such condition that upon the application of a certain amount of heat the lower flange revealed a crack, allowing the material to drop and admitting fire into the interior of the rod to such an extent that the steel tie-rod was melted entirely off. Manifestly, such condition was no fault of the material, but was chargeable to poor construction, and we have no doubt that there are many points in the fire-proofing of our large buildings which would fail in an excessive test and would apparently give ground for the condemnation of the particular style of construction, whereas the fault would be chargeable entirely to the lack of proper supervision of the work and the carelessness in which the details had been carried out. We are rapidly developing our building operations into a condition of exact science. When we take the same care with our protecting envelope of terra-cotta that we do with the steel skeleton itself, and are equally rigid in inspection, tests, and supervision, the chances of failure to fulfil all the conditions of fire-proofing will be greatly lessened.

THE LONDON FIRE.

FIRE-PROOF construction can be fairly claimed as an American development. We say this without any forgetfulness of the very valuable work which has been done in France and Germany, especially in the former country, where a species of fire-proofing, which has answered a certain purpose, has been in constant use for indefinite generations. The fire-proofing which meets the requirements of French construction would not, however, answer for us, and it surely does not operate in France to prevent pretty disastrous results at times. We doubt if any modern fire-proof buildings of this country have ever passed through a more disastrous conflagration than that which destroyed the large Magazins du Printemps, in Paris, a number of years ago, a structure which, according to French standards, was strictly fire-proof, was certainly planned better than the Pittsburgh buildings to resist fire, but which was totally wrecked, far less of its construction surviving the fire than was the case in the Pittsburgh fire. The fact that there are so comparatively few fires in France is very largely due to the methods of construction, which, though by no means fire-proof to the extent that we expect in our first-class buildings, are certainly much more capable of resisting a conflagration than the average structure in this country. Besides this, the French go about heating their buildings in a manner far different from our own, and one of our most fruitful sources of fires, defective flues, are by no means as dangerous there as they are with us. We have been obliged from necessity to develop our fire-proof constructions, because the majority of our buildings are so ill adapted for resistance, or to put it perhaps more truly, are so admirably planned to facilitate the spread of fire, and in order to secure any reliable protection we must carry our systems much further than is necessary abroad, and they are materially modified by contingencies which are not thought of elsewhere. It still remains a fact, however, that, *per se*, the foreign fire-proofing methods are, as compared with our own, unscientific and unreliable when tested in extreme cases. The recent conflagration in London affords an illustration of what has not been done abroad, and we notice by reports in technical journals that the official inquiry which has been undertaken to determine the causes of the fire and to investigate the possibilities for prevention for the future has developed the fact that in the opinion of the property owners the expense of making the reconstruction of this district of a thoroughly fire-proof character was such as, in their judgment, to be prohibitory, though the Goldsmiths' Company, which owns the land upon which the building stood, is perfectly willing to agree to a subdivision of the various structures in such a way as to check the spread of fire. We haven't a great deal of confidence in official investigations, especially when directed towards the premises of a wealthy and powerful corporation, and we are almost inclined to doubt whether such an investigation as will result from the London fire can be anything more than one-sided. That is to say, what is considered good fire-proofing practise abroad is not up to the standard which we should expect, and we can hardly expect the investigators to appreciate the necessities which are considered so paramount with us. We believe that the theory of fire-proofing as developed by us is scientifically perfect, our failures being due to lack of attention to detail, or to our not carrying our own systems to a logical and perfectly natural conclusion; whereas, the English systems of construction, if considered as means of preventing the occurrence of a large fire, are radically wrong, though many of the details of construction, such as stairways, arrangement of flues, subdivisions of premises, are better than are usually enforced in our large cities. London has had abundant occasion to learn her lessons in fire-proofing, but, large as that metropolis is, the fire losses there are so much less than the value of what is destroyed annually in our larger cities, that we can quite understand the reluctance of the Goldsmiths' Company to enter upon expensive and radical change in methods of construction. The Englishman is nothing if not conservative, and the fact that such systems have stood or given satisfaction for generations can easily be alleged as reason for reluctance in making the change.

Mortar and Concrete.

CHARACTERISTICS OF VARIOUS BRANDS OF AMERICAN NATURAL CEMENTS.—Continued.

BY CLIFFORD RICHARDSON.

Pennsylvania Magnesian Cements. Some magnesian cements are, or have been, made in Pennsylvania at Milroy, and a few other places, and classed as Rosendales. These have not proved of the highest quality. The hydraulic limestones either contain an excess of magnesia or a deficiency of silicates, and as with some others from the same State, free from magnesia, do not seem to be suited to the production of a high-grade natural cement. This part of the country is, in consequence, devoting itself more and more to the development of the Portland cement industry, for which its limestones, free from magnesia, seem entirely suitable.

Cements of the Middle West. The vast quantity of natural cement in use from the Gulf to the Lakes, and from Ohio to the Rocky Mountains, is supplied chiefly by brands made near Milwaukee, Wis., Louisville, Ky., and Utica, Ill., with smaller amounts made at Fort Scott, Kan., and Mankato, Minn., and a few other less important works. These cements are all magnesian, but vary very considerably in their composition, and consequently in their character.

Analyses of samples of these cements have already been given, but the physical tests recorded have been more or less incomplete. For the purpose of comparison among themselves, the results of tests made at Minneapolis, to which reference has been made already, will serve, although they are much lower than would be the case were the test pieces made to yield the best results with dry mortar and the proper compression.

AVERAGE RESULTS OF CEMENT TESTS FOR A SERIES OF YEARS FROM 1888 TO 1895.

BRAND.	Tensile Strain per Square Inch.										
	Neat.										
	24 hours.	7 days.	1 month.	2 months.	3 months.	4 months.	6 months.	1 year.	2 years.	3 years.	5 years.
Louisville	131	142	202	271	327	353	368	416	443	460	493
Milwaukee	106	120	156	232	302	309	327	372	434	411	434
Mankato	109	119	218	238	259	273	280	319	336	317	335
Utica	53	153	246	236	257	268	242	259	282	320	281
Buffalo	119	172	260	294	305	336	290	346	...	...	...
Akron	91	151	216	308	317	373	364	369	410	...	...

1 CEMENT. 1 SAND.											
Louisville	70	85	118	150	178	211	257	271	311	320	285
Milwaukee	59	84	120	158	186	208	214	235	257	286	...
Mankato	49	67	140	163	179	171	182	195	186	183	...
Utica	21	100	160	164	182	198	156	195	212	292	240
Buffalo	60	73	128	191	206	222	212	167	...	...	...
Akron	65	78	145	203	219	220	213	202	160	...	...

1 CEMENT. 2 SAND.											
Louisville	37	50	71	95	110	120	144	161	173	172	165
Milwaukee	32	53	94	118	135	148	152	150	191	202	...
Mankato	31	43	96	110	120	125	126	153	138	179	...
Utica	19	96	117	111	122	126	121	134	172	213	179
Buffalo	29	39	73	92	115	110	103	97	...	...	...
Akron	38	47	96	155	152	173	149	115	110	...	...

Milwaukee Cement. This cement, as at present made, carries a large amount of magnesia, over 20 per cent., and has all the properties which are to be expected of a cement of that kind. The alumina and iron are not high, and a considerable part of the silicates are not decomposed and combined with the alkaline earths, owing to its being lightly burned. The result is that it gains strength more slowly than some other brands, but at a considerable age is quite equal to them in strength and toughness, and is often stronger in mortar and concrete, as can be seen by reference to the tests made at Minneapolis and from the examination of concrete in which it has been employed. The slow way in which it at times acquires strength

necessitates care in using it during cold weather. It requires a medium quantity of water to make a mortar, and it will also be found to harden better in air than when immersed in water or allowed to remain in damp surroundings. It makes a smooth mortar, trowels well, and works easily in concrete. At its best no Western cement has given more satisfactory results. Vast quantities of work have been satisfactorily done with it, but, like all natural cements, there are variations in the quality, and it is reported to have been better some years ago than to-day. In general it is free from excessive expansion like the Western New York cements, but it resembles them in its composition very closely, and has now and then caused ridges in concrete.

The color of Milwaukee cement is a gray with a brownish tinge, more nearly like Portland cement than any of the Western brands except that made at Mankato.

Utica Cement. The natural cement made in La Salle County, Illinois, near Utica, is derived from a rock carrying a large amount of magnesia. To produce a satisfactory cement, it is now burned so that but a relatively small part of the silicates of the stone are decomposed and combined with lime, as compared with many other brands, and all the carbonic acid is not expelled. It has the usual characteristics of cements high in magnesia, and resembles the Western New York and Milwaukee cements in certain respects; but it is even more distinctively a magnesian cement than these, as it contains, in the specimen analyzed, but about 9 to 10 per cent. of combined silica, less than 5 per cent. of alumina and iron oxides, and as much as 17 per cent. of sand and silicates remaining undecomposed. On this account much of its hydraulic properties and strength must be attributed to the magnesia which is uncombined with silica, and in this respect it is probably unique in this country.

It is the lightest colored natural cement made, being a little more than off white, is very plastic, making a clay-like mortar with a medium amount of water, which has considerable covering powers, and trowels well. As made to-day, at its best, it has a high initial strength both neat and with sand, and continues to gain for long periods.

Louisville Cement. Louisville cement is put upon the market by a large number of different mills, and is made from rock obtained at various quarries, although all from the same formation. It is consequently a more or less variable article. As a whole, this cement has much less magnesia than either the Milwaukee or Utica brands, and in this respect is more like that made at Fort Scott, Kan., and Mankato, Minn. It is, like the latter, more thoroughly burned than those cements containing more magnesia, such as Utica cement, a small proportion of the silicates and silica only being left undecomposed. It requires more water to make a mortar than the lighter-burned cements, being quick setting as a rule, and it acquires its strength more rapidly. In time, however, no better results are obtained in sand mortar than with many other cements. Some of it is very quick. As a whole it requires to be used with care, and, as there are several different brands of Louisville cement, there may be as much variation in the supply as is the case with the Rosendales. Concrete constructed with Louisville cement has proved as satisfactory, in the opinion of those who have used it, as that made with any of the Western natural cements.

Fort Scott Cement. This cement is a pretty thoroughly burned product from a stone having about 12 per cent. of magnesia and not very rich in silicates to afford alumina. Being so well burned, it sets very fast if not previously hydrated. It varies in strength according to the care given in burning it, and high or low results may be obtained with different brands, in which respect it differs not more than many other kinds of cements. It eventually seems to give a strong mortar even when initially weak. It works smoothly, but requires more water in making a mortar than any of the natural cements, being quite peculiar in its action when first mixed, a preliminary reaction seeming to take place with the absorption of much of the water. Mortar made with it should be worked for some time and not made too dry.

Its color is characteristic, being quite a bright yellowish brown.

Mankato Cement. This cement is well burned, and similar to the Fort Scott and Louisville in composition, being, like them, somewhat deficient in alumina. It requires a medium amount of water, and gives good returns in strength soon after use. The mortar is not quite as plastic as that of the more magnesian brands. The writer has had no extended experience with this cement, but the Minneapolis tests, however, show that in ordinary sand mortar it continues to increase in strength for a long time, and compares favorably with the other Western natural cements, while in street work in that city it has been tried most severely and successfully by being exposed to travel for some time in concrete before being covered with an asphalt surface. Its color is similar to that of Milwaukee cement, a dull brownish gray.

Maryland Lime Cements. Of the same nature as the Round Top, which was selected as a type of these cements, are several other brands in use to a considerable extent in the markets of Washington, Baltimore, and the country adjacent to the places of manufacture, which are located along the Potomac in Western Maryland. Some recent tests of these cements have been published in the report of Mr. A. W. Dow, Inspector of Asphalt and Cements, of the Engineer Department of the District of Columbia, which are as follows:—

Brand.	Round Top.	Cumberland.	Cumberland and Potomac.	Cedar Cliff.
Tensile strength:—				
Neat, 1 day	81	169	146	88
7 days	203	218	204	185
2 parts quartz, 7 days .	122	156	188	85
1 month	255	297	225	195
3 months	342	356	403	255
6 "	387	350	397	299
1 year	515	438	436	364
Per cent. of water, neat	32.	32.	32.	32.
quartz 14.	15.	15.	15.	15.

These lime cements set very quickly and acquire strength very rapidly, especially in sand mortar. It has been found, also, that they are not as much affected at early stages by the use of and excess of water as the magnesian cements. They have often a tendency to set too rapidly, heating strongly on mixing with water. This, however, it has been shown, can be avoided by proper sprinkling of the burned stone before grinding. Owing to the rapidity with which strength is acquired, these cements are peculiarly suited for arch work where it is convenient to draw centers soon after the completion of the work. In masonry work they are not as attractive, as the mortar often sets too quickly and does not trowel as well as that made with the magnesian cements. Especially in the form of neat mortar some of these lime cements become at times more or less brittle with age, owing to crystallization, but this is not as apparent in concrete, although with some brands the concrete has a greater relative tensile strength than toughness, fracturing more readily under a blow than concrete of magnesian cement.

Lime Cements of the Lehigh Valley. A cement is made along the Lehigh River, at Copley and other places, which is similar in some respects to the lime cements of the Potomac Valley. It is quite free from magnesia, sets with great rapidity, and is, as a rule, fiery. It gives a great initial strength, but in other respects cannot equal the Potomac cements. It is more often, since the establishment of the Portland cement industry in the same locality where it is made, mixed with a certain proportion of the second grade of this cement and sold as an "improved" natural. Much of it in its original form is very inferior. It is made from a rock which is now largely devoted to the manufacture of Portland cement when mixed with a purer limestone.

Other Cements. There are a number of other cements upon the market which are not as important commercially, and with which the writer is not personally acquainted. Their quality has not warranted, as a rule, their manufacture on a large scale, and they are employed only locally.

From the examination and comparison which has been made of

the several kinds of natural cements which are made in the United States, it appears that there are such decided differences in their character that they may be classified as follows:—

I. Lime cement, containing only 2 or 3 per cent. of magnesia, 13 to 15 per cent. of oxides of iron and alumina, and about 20 per cent. of combined silica.

II. Lime cements with as little magnesia but with less silicates than class I., and consequently less satisfactory and more fiery.

III. Magnesian cements, with, at their best, about 15 per cent. of magnesia and the same amount of oxides of alumina and iron, with 15 to 20 per cent. of combined silica and considerable uncombined silicates, being not thoroughly burned.

IV. Magnesian cements with a large amount of magnesia, over 20 per cent., less alumina and iron, and less undecomposed silicates than in the preceding class.

V. Magnesian cements deficient in alumina and iron oxides and in combined silica, being lightly burned, but high in magnesia.

VI. Magnesian cements thoroughly burned, made from rock having a smaller amount of silicates than those of class IV., with only a medium per cent. of magnesia and little uncombined silicates.

Cements of the first class set and acquire strength rapidly, and increase in this direction for long periods. The final result is a more brittle mortar than is obtained with the magnesian brands.

The lime cements of the Potomac Valley are included in this class.

The second class has not as favorable a relation of silicates to lime, and consequently the cements are apt to be fiery and not as satisfactory. They are generally subjected to improvement by the addition of Portland cement, and are then used successfully. They are found in the Lehigh Valley.

The third class is represented by the best Rosendale brands, which set and acquire strength slowly, but which continue to develop it for long intervals and are eventually very strong and tough.

The fourth class includes cements like those of Western New York, which have been, while containing an unusually large amount of magnesia, burned so hard that little of the silicates have remained undecomposed and uncombined with the lime and magnesia, and in consequence are apt to expand a long time after use unless carefully hydrated before grinding.

The fifth class is one in which the cement is essentially a light-burned, highly magnesian material, in the preparation of which the heat has not been sufficiently high or prolonged to bring the greater portion of the silica into combination with lime and magnesia, in this respect being in contrast with the preceding class. The hydraulic properties and strength are due, therefore, largely to the magnesia and carbonates rather than to the silicates and aluminates. The cements of La Salle County, Illinois, represent it.

The last class contains the Louisville and Fort Scott cements, in which there is much less magnesia than in the two preceding, and less alumina and iron oxides than in the cements of the third class, although they are burnt so thoroughly that there is but a small per cent. of silicates and silica uncombined.

Notwithstanding all this variation in the character of the natural cements of the United States in practical use, they will all of them, when properly burned and carefully handled, give results which are only in the most exceptional cases failures. The writer is unaware that there has ever been an actual failure in masonry due to the natural cement used in its construction, although some important and extensive bridge work has been laid with it, and although it has frequently been used in the most careless way, being retempered after its original set or employed in the form of a very sloppy mortar. In concrete, inferior results are now and then obtained, especially in cold weather, or when the cement has been of some brand that has not been most carefully burned and put into the work. As a rule, with sufficient time, a natural cement mortar will acquire a satisfactory strength, even if originally weak, or unfavorably influenced by the conditions under which it has been used and the environment to which it is subjected.

The Masons' Department.

BRICK VENEER CONSTRUCTION.

BY FRED T. HODGSON.

THERE is a species of construction in which a facing of 4 ins. of brickwork is applied to the outside of a wooden frame, giving the simulation of a solid brick structure. This device is seldom met with in the East, but is quite common in the North and the West and in the Canadas; and though owing its origin to conditions of a time when framing lumber was cheap and bricks were expensive and not easily obtained, it has persisted in spite of its manifest sham, and has ascribed to it virtues which are hardly offset by its illogical character. Most people who desire to use this construction have the impression that a frame house veneered with bricks will cost considerably less than would a similar house if the walls were solid and of the usual thickness. In an experience of many years I have seldom been able to persuade a client to substitute a solid brick-walled house for the intended veneered sham; and yet the difference in the cost is in favor of the solid wall, if the veneering is figured as being properly done, and the woodwork for the skeleton built in a thorough and substantial manner.

The foundation walls required to sustain a veneered house must of necessity be as costly as those for a brick superstructure of corresponding dimensions; consequently there can be no saving in the foundation work. All bricks used in veneering must be good facing bricks of good quality, and, as the veneering is but 4 ins. in thickness, all the brickwork, excepting quoins, must be formed of stretchers, no "bats" being permitted; consequently the bricks will cost from 25 to 40 per cent. more than would bricks required for a solid wall, while the labor of laying a 4 in. brick course, including tying or bonding the bricks to the woodwork, is nearly double that of laying bricks in a solid wall. Then, the brick veneer must be laid from an outside scaffold, an expense not always necessary in the building of a solid wall; and iron, japanned, tarred, or galvanized ties or anchors to hold the bricks in position must be employed, at the rate of three to every hundred bricks laid in the wall, and these ties must be fastened to the woodwork on the frame and the projecting ends built in the brickwork. This is another expense which does not obtain with a solid wall.

As a rule, wooden window sills are used in veneered houses, the use of stone being almost prohibited because of the shallowness of the reveal. If stone sills are used, it is quite evident the cost of sills and setting them will exceed the cost of the same sills if used in a solid wall. The window and door frames required for a veneered house will cost just as much, and, in most cases, a trifle more than will corresponding frames for a solid wall, and the chances of a tighter connection to the wall are greatly in favor of the latter.

The opportunities for fashioning ornamental brickwork on a veneered building are so few and expensive that they are rarely embraced, unless the ornamentation is of the crudest and most primitive sort, conditions that do not obtain in solid brick walls. The arching over windows and doors in veneered work is of the flimsiest kind, and the least disturbance in the building is sure to make itself felt in these weak spots by cracking or displacing joints, as it is impossible to properly bond or tie the work at these points.

Inside the brick veneer there is erected a frame-studded skeleton. On the studding is nailed 1 in. pine or hemlock square-edged boards. Sometimes the stuff is dressed and matched, which adds to the cost; at other times it is nailed on the studding diagonally, with a view of giving strength to the structure. When this is done and the frame is boarded in both sides, the boards are so nailed that the joints cross each other, thus forming a double bracing. In the Northern, Northwestern, and Western States and the Canadas the outside boarding is covered with felt or building paper before the brickwork

is commenced; and some builders also line up the inside of the house with suitable paper under the lathing. This, when carefully done, makes a warm wall, but it takes a great deal of time and care to paper around the openings and well in between the joists, and in contract work it is next to impossible to get workmen to make wind-tight joints with the paper at these points.

It is easy to see that the labor and materials used in the construction of the necessary frame ready to be veneered would cost very much more than the extra bricks and labor required to make the wall a solid one, and the walls of a veneered house, built as they ought to be, cost from 15 to 25 per cent. more than would good solid 9 in. walls.

Now, then, let us see some of the defects of a veneered house, and what is likely to result from these defects. Everybody knows that wood expands and contracts with every change of atmospheric conditions, thus causing a quiet but sure tearing away of the bonding connecting the two materials together, a condition that in the end must bring ruin to the building. It is almost impossible to fit bricks around window and door frames sufficiently tight to keep out wind when the wall is only 4 ins. thick. If, however, in veneering, care is taken and labor expended in having the joints between the frames and boarding properly covered with paper, well tacked on, it is possible to make the joints fairly tight, and they will remain so until the paper becomes broken, or falls away from the brick from decay or other causes. This expenditure of labor and time, however, adds materially to the cost of the veneering. That brick veneering is a sham goes without saying, for the experienced eye knows as soon as it looks at the building that it is veneered. A wall showing nothing but stretchers cannot deceive even the apprentice boy, and if, as I have known in several instances, an attempt is made to cheat the eye by making every sixth course of bricks appear as headers, by using "bats," a glance at the reveals and at the ornamental work will convince the experienced in a moment as to the true character of the walls.

After a careful consideration of the whole matter, and from facts gleaned from actual observation and experience, I have arrived at the conclusion that there is nothing to be gained, but considerable lost, both in economy and in efficiency, from building brick-veneered houses instead of houses with solid brick walls.

CRACKS IN PLASTERING.

HASTE is one of the drawbacks to good construction, and the results of hurry manifest themselves in nearly every department of building. The cracking of plaster cannot be blamed entirely to the shrinkage of wood or settlement of the foundations, for a certain kind of cracking in all lime mortar is due solely to haste in preparing the material. Lime mortar hardens by a species of absorption and a drying process quite distinct from the action of hydraulic cement. In order that the drying shall be uniform throughout the mass of lime mortar, it is essential not only that the lime be slaked for a long period before it is mixed with the sand, but also that the mortar should be mixed a considerable time before it is to be used, and that it be thoroughly manipulated, so that the particles of lime are evenly distributed, and the mixture perfectly homogeneous. Of course this is on the assumption that the lime is good to start with, which, unfortunately, is not always the case. Plasterers pay little attention to preparing mortar; this is usually left to the cheapest kind of labor, and if any one watches the average mechanic mixing mortar, it is evident that such a thing as a careful proportioning of materials received very little thought. We often find mortar which has stood for generations and is thoroughly hard, comparing very favorably with cement, but this is in the old buildings, and is a result of the care which was at times expended upon such work. It was formerly the custom to not only mix the mortar and sand together in the bed, but also to work it over carefully on a stone slab, thoroughly kneading it and mixing it before applying to the wall, securing thereby a perfect uniformity of composition which would insure a gradual drying of the plastering.

Brick and Terra-Cotta Work In American Cities, and Manufacturers' Department.

NEW YORK.—With the dawn of the new year comes the realization of our prophecies and dreams as to our great city, now Greater New York indeed, the second city in the world in



DETAIL ON THE JEWELERS' EX-
CHANGE BUILDING, BOSTON.

Winslow & Wetherell, Architects.
Executed by the Perth Amboy Terra-Cotta
Company.

Hours, 9 A. M. to 6.30 P. M.; 8 P. M. to 10.30 P. M.; Sundays, 10 A. M. to 6 P. M.

Public Lectures, Wednesdays, February 16, 23, and March 2.
Smokers, Saturdays, February 19, 26, and March 5.

These exhibitions have been eminently successful in the past, and have been a tremendous factor towards the advancement of architectural taste and criticism. The League will collect and return, free of charge to exhibitors in Greater New York, Philadelphia, and Boston, all exhibits that have been entered.

At the monthly dinners of the League recently, the subjects

discussed have been of vital interest, not only to architects, but to the general public. The subject at the January dinner was "Bridges," and the matter was thoroughly and intelligently dis-

Mr. Thomas J. Brady has been placed in charge of the Building Department, with two deputy commissioners. It is expected that some changes in the existing building laws will result, in which case they will be fully noted in these letters.

The Thirteenth Annual Exhibition of the Architectural League will be held in the Vanderbilt Gallery, Fine Arts Society Building, 215 West 57th Street, during February. The dates of the important events are as follows:—

Press View, Thursday,
February 10, 10 A. M. to 4 P. M.

Annual Dinner, Thursday,
February 10, 7.30 P. M.

League Reception, Friday,
February 11, 8 P. M.

Public Exhibition from
Saturday, February 12, to Sat-
urday, March 5, inclusive.



TERRA-COTTA DETAIL, BAY WINDOW CURTAIN WALL, ATWOOD BUILDING, CHICAGO.
Executed by the Northwestern Terra-Cotta Company.



TERRA-COTTA MANTEL, HOUSE AT PHILADELPHIA, PA.
Peabody & Stearns, Architects.
Terra-Cotta executed by the Standard Terra-Cotta Company.

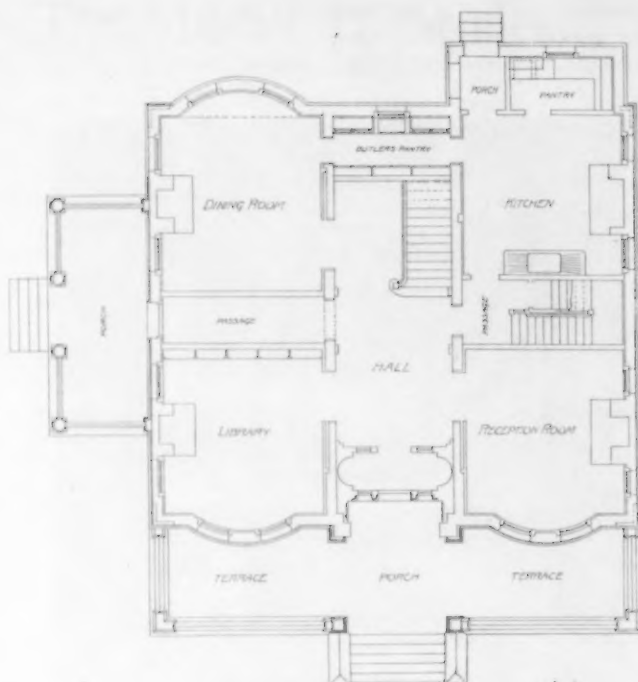
cussed by the members. There was a strong sentiment in favor of more monumental bridges, enriched by sculpture, etc., than are now being built. With one notable exception,—the Brooklyn Bridge,—our bridges are not particularly ornamental structures.

At a previous dinner the subject was "Small Parks and Gymnasiums in the Crowded Districts." This subject was also intensely interesting, and was made more so by a score of clever plans prepared by different members and explained by them.

Among important competitions recently decided are: The Ellis Island immigration stations, for which the plans of Messrs. Boring & Tilton have been accepted. There will be five buildings, to be built of brick, stone, and iron, thoroughly fire-proof; cost, \$570,000. Erasmus Hall High School, Brooklyn, a brick and stone building to cost \$400,000, in which the successful architects were Messrs. Glover & Carrel. The College of the City of New York, Morningside Heights, for which the plans of Mr. George B. Post have been accepted.

These buildings are in the Collegiate Gothic style and will form a handsome group. The site could not be excelled. The cost will be about \$1,000,000.

Plans are being prepared by Bruce Price for a large hotel to be built on Madison Avenue, corner of 42d Street.



FIRST FLOOR PLAN, HOUSE AT PITTSBURGH.

Alden & Harlow, Architects.
Elevation shown on Plate 8.

McKim, Mead & White are preparing plans for the new Union Club House, to be erected on 54th Street and Fifth Avenue, at a cost of about \$1,000,000.

CHICAGO.—Chicago had an epidemic of fires about Christmas week. One of the losses was the Quadrangle Club Building, the club headquarters of the professors of the University of Chicago. This building, previously referred to in THE BRICKBUILDER, was designed by the late C. B. Atwood. It was colonial in design, and was executed in rough, red sandmold brick, with large white mortar joints, and laid with Flemish bond. The cornice and broad white frieze were of wood, and the roof was of green slate. In rebuilding, the same design will be used, but with a wing for a necessary enlargement of the building. Architect Howard Shaw is working on the drawings.

Another building burned was a gymnasium. This was con-

nected with the academic department of the university, and was located in Morgan Park, a suburb.

The most serious fire loss was that of the "Coliseum," which was used for general exposition purposes, from a horse show to a bicycle race or a football game. This building, which was erected since the World's Fair, and near the site of same, gained notoriety from its collapse and almost total destruction during construction, when the great steel arches were, about half of them, in place and covered with an expanse of wood plank roof.

Building news reporters say that architects are smiling over projects, although the amount of work actually going ahead is not great. A certain amount of activity in real estate, however, gives some promise for the spring season. Mr. Phipps, of Pittsburgh, has bought ground on Monroe Street, and commissioned Jenney & Mundle to design an addition to the New York Life Building.

Studebaker Brothers are having S. S. Beman design a new building, and also add a tenth story to their Michigan Avenue structure.

Several transfers of property in the business center seem to hold



PIECE OF TERRA-COTTA DETAIL.
Executed by Gladding, McBean & Co., San Francisco, Cal.

promise of new buildings of a commercial character. A recent loan of so small an amount as \$12,000 at 4¼ per cent. on property not in the central district is taken as an important example, showing the tendency toward lower interest rates, and possibly a corresponding increase in building operations. Curiously enough, it is said that the largest proportion of building the past year has occurred in the World's Fair district, which was thought to have been most seriously overbuilt.

The Union Mutual Life Insurance Company (D. G. Hamilton, resident director) has had contracts let for the erection, at Cottage Grove and 34th Streets, of thirty-two houses to cost about \$228,000. They expect to build fifty more as soon as these are finished.

Shepley, Rutan & Coolidge are designing a group of buildings for the Chicago Orphan Asylum at Grand and 51st Street Boulevards. The exteriors will be colonial in style, with brick facing, terra-cotta trimmings, and slate roof.

The brick business in Chicago during the past year certainly has been far from satisfactory. Common brick have been delivered at buildings from \$3.20 to \$4.00 per thousand; since October, however, the price has risen to \$6.00. The Chicago Hydraulic Brick Company say that 33 per cent. less pressed brick were sold during 1897 than in 1896, and that the price was 20 per cent. less.



TERRA-COTTA PANEL, AMERICAN BAPTIST PUB. SOCIETY BUILDING, PHILADELPHIA, PA.

Frank Miles Day & Bro., Architects.
Executed by the Conkling, Armstrong Terra-Cotta Company.

GOES TO ST. LOUIS.

MR. HENRY E. MACK, for many years the general manager of the Eastern Hydraulic-Press Brick Company, has been called to St. Louis to assume the general management of the Hydraulic-Press Brick Company's immense business. Mr. Mack's achievements in developing the substantial success of the Eastern Hydraulic-Press Brick Company's business have long been recognized in the burnt-clay market of the East; it is therefore natural that the St. Louis Company, the parent of all other hydraulic companies in the country, should desire to have the direct association of his astute abilities in the management of its vast enterprises.

NEW CALENDARS AND CATALOGUES.

F. B. GILBRETH, 85 Water St., Boston, has again issued his novel and interesting calendar, which is intended as an advertisement for his system of waterproofing cellars. It is attractively gotten up, and made especially interesting to seaboard people, from the fact that the hours of tides serving are given for each day of the year.

We are in receipt of a very handsome calendar for the coming year from A. Miller & Son, of Bradford, Pa., manufacturers and dealers in fine pressed brick. The illustration

on the calendar is a half-tone reproduction of Wirkner's famous painting, "Diana and the Fawn."

SAMUEL H. FRENCH & Co., of Philadelphia, manufacturers of



BOSTON ATHLETIC CLUB BUILDING.
Sturgis & Cabot, Architects.

Peerless Mortar Colors, send their New Year's greetings in the form of a very attractive and useful calendar of the memorandum pad style, each leaf of which is divided into the seven days of the week, with liberal space opposite each date for memorandums.

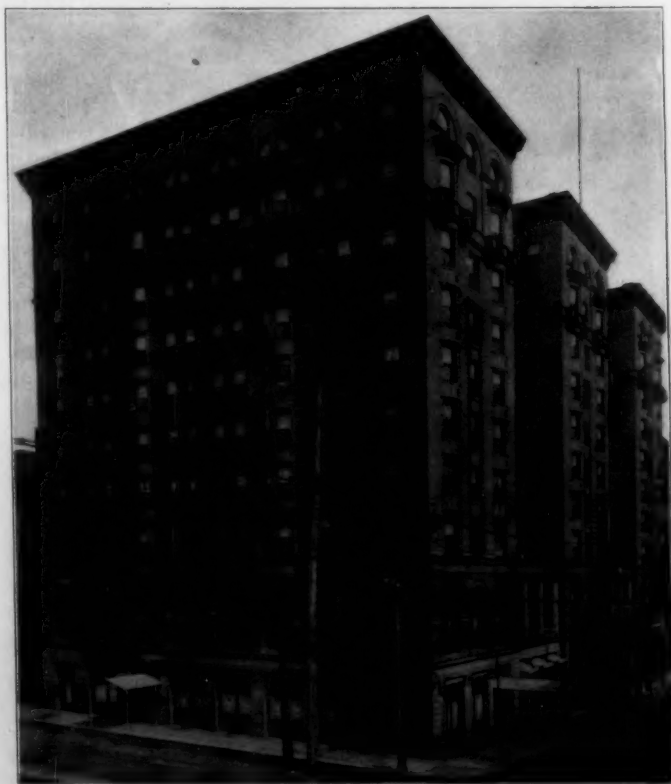
A VERY attractive calendar for 1898 has been issued by Jas. A. Davis & Co., 92 State Street, Boston, New England agents for the Alpha Portland Cement. Particular interest is attached to the illustration of this calendar, namely, two thoroughbred Boston bulldogs, from the fact that they were raised and are owned by Mr. Davis.

R. GUASTAVINO Co., fire-proof construction, Boston and New York, have issued the first of their bi-monthly calendars, the illustration of same being a three-part view of the roof over St. Anthony's Chapel, St. Matthew's Church, Washington, D. C.; Heins & LaFarge, architects. It is the intention of this company to send out a new calendar bi-monthly throughout the year, each having as a subject some illustration of their method of construction as employed on some prominent building.

F. W. SILKMAN, 231 Pearl Street, New York, importer of minerals, clays, chemicals, and colors, has sent us one of his very attractive hanging calendars, at the top of which is a striking picture in colors of two fine specimens of Gordon setters.

THE Correspondence School at Scranton, Pa., has issued a booklet the contents of which is a substantial endorsement of the architectural courses conducted by them, eighty students bearing testimony to the value of these courses.

WE are in receipt of a new catalogue just issued by the American Enameled Brick and Tile Company, illustrating and



PLANTER'S HOTEL, ST. LOUIS.
I. S. Taylor, Architect.
Front brick furnished by the Hydraulic-Press Brick Company.

describing their "standard colors, sizes, and special shapes of enameled and patent interlocking enameled wall tile."

A valuable feature of the catalogue is the practical description given of the details required for arch brick (enameled) in English, American, Roman, or Norman sizes. These details are accompanied by explanatory diagrams. Particular attention has also been given to the illustration of some ninety-five different shapes of molded brick which the company manufacture, and also to the variety of colors which they make. In order to facilitate selection in these there has been incorporated in the catalogue a colored chart showing fifteen different shades of brick.

The closing pages of the book are devoted to the description of a patent interlocking tile owned and manufactured exclusively by this company. These tiles are especially designed for the facing of walls, or for use in floors or ceilings. They are described as "an economizing brick or bonded tile for walls."

We can heartily recommend to our readers a perusal of this little volume as being a work which contains considerable information on enameled brick.

INTERESTING NEWS ITEMS.

CHARLES BACON, Boston, representative of Sayre & Fisher Company, has been awarded the contract for enameled brick for the new Southern Terminal Station, Boston.

ATLAS PORTLAND CEMENT is being used on foundations for new building on India Street, Boston; W. T. Sears, architect.

THE GRUEBY FAIENCE COMPANY is supplying the enameled tiles for the Subway Station, Haymarket Square, Boston.

THE patent Cleveland Steel Wall Ties made by the Cleveland Wire Spring Company, Cleveland, Ohio, have found a ready recogni-

tion among architects and builders throughout the country, excellence of manufacture and price giving them preference in the market; Samuel H. French & Co. are the handlers for Philadelphia, and Meeker, Carter & Booraem for New York.

THE DAGUS CLAY MANUFACTURING COMPANY has closed a contract to supply 170,000 brick for a new factory building at Straights, Pa.

CHARLES BACON, 3 Hamilton Place, Boston, has been appointed agent for the Celadon Roofing Tiles.

FISKE, HOMES & Co. have just completed the building of twenty-four brick and terra-cotta fireplaces for the Raleigh Chambers on Mountford St., Boston.

R. GUASTAVINO COMPANY propose this present year to devote especial attention to fire-proof staircase construction, of which they have always done more or less.

THE DAGUS CLAY MANUFACTURING COMPANY, of Dagucabonda, Pa., are putting a fine line of Pompeian brick on the market in standard and Roman sizes.

THE RIDGWAY PRESS BRICK COMPANY, through their Pittsburgh agent, James R. Pitcairn, are furnishing the mottled gray Roman bricks for a new office building, and a residence at Pittsburgh.

WM. WIRT, CLARK & SONS, Baltimore, Md., agents for the Union Akron Cement, report that this cement is now being used by the Pennsylvania Railroad Company at Sunbury, Pa., and by the West Maryland Railroad Company at Hagerstown, Md.

THERE will be a large amount of architectural terra-cotta used in the new building for Jordan, Marsh & Co., Chauncy and Bedford Streets and Avon Place, Boston. This contract has been awarded to Waldo Brothers, agents for the Perth Amboy Terra-Cotta Company.



HOUSE AT ST. LOUIS.

Barnett, Haynes & Barnett, Architects.

Terra-Cotta executed by the Winkle Terra-Cotta Company. Front Brick furnished by the Hydraulic-Press Brick Company.



DETAIL OF ENTRANCE, HOUSE AT ST. LOUIS.

Barnett, Haynes & Barnett, Architects.



DETAIL OF WINDOW OVER ENTRANCE, HOUSE AT ST. LOUIS.
Barnett, Haynes & Barnett, Architects.

THE Navy Department has adopted the Mason Safety Tread for use in vessels, after the favorable report of an examining board, and requisitions have been made for the material for application to stair treads and other places on half a dozen battleships and cruisers.

ON the thirty-story Syndicate Building, Park Row, New York, the "Brooklyn Bridge Brand" Rosendale Cement is being used exclusively. Sixty-five thousand barrels of this cement were used on the New York Croton Aqueduct in 1897.

SAYRE & FISHER COMPANY front bricks will be used in the new residence for Mr. Fay on Commonwealth Avenue, Boston; J. T. Kelly, architect; also for the Jordan Building, Boston; Winslow & Wetherell, architects.

THE EXCELSIOR TERRA-COTTA COMPANY, through their Boston agent, Charles Bacon, will supply the architectural terra-cotta for the Spalding house at Pride's Crossing, Mass.; Little & Brown, architects; also for the Wood, Pollard & Co. Building, Boston; Shepley, Rutan & Coolidge, architects.

THE GRUEBY FAIENCE COMPANY, Boston, have executed a



ST. LOUIS DAIRY COMPANY'S BUILDING.
W. Albert Swasey, Architect.

frieze, 125 ft. in length, of painted tiles in Delft blue, representing a panoramic landscape in Holland, for the grill room in the new addition to the Reynolds House, Boston; Arthur Vinal, architect.

THE RIDGWAY PRESS BRICK COMPANY, through O. D. Person, their New York agent, will supply 150,000 mottled and 4,000 ornamental brick for the new high school building at Newark, N. J. Also 120,000 stiff mud buff and gray bricks for the new school building at Newtown, L. I.

THE BERLIN IRON BRIDGE COMPANY is building the new 180 ft. drawbridge over the South Shrewsbury River, N. J.; also rebuild-



BOARD OF EDUCATION BUILDING, ST. LOUIS.
I. S. Taylor, Architect.
Front brick furnished by Hydraulic-Press Brick Company.

ing the boiler house for the Riverside Worsted Mills at Providence, R. I. This building is to be made fire-proof, the walls are of brick, the roof being of tile with metal supports.

THE BURLINGTON ARCHITECTURAL TERRA-COTTA COMPANY will supply terra-cotta on the following new contracts: residence 38th and Ludlow Sts., Philadelphia, A. S. Wade, architect; stable at Caldwell, N. J., Jeans & Taylor, architects; and a new building at Philadelphia, for which H. E. Flower is the architect.

THE CELADON ROOFING TILE COMPANY, Charles T. Harris, Lessee, have closed contracts for roofing tile for two houses for Sanford P. Ross, Newark, N. J., H. E. Reeve, architect; 8 in. Conosera. Engine House, New York City Fire Department, Percy Griffin, architect; close shingle. Correspondence School at Scranton, W. Scott Collins, architect; 8 in. and 2 in. Conosera in combination.

W. T. BIRCH, Corcoran Building, Washington, D. C., writes as follows in regard to his use of Cabot's Creosote Shingle Stains on bricks: "I used them in two instances on old and discolored press-brick fronts, and with most gratifying

results. The brickwork now, after several months' exposure to sun and rain, looks quite as well as new."

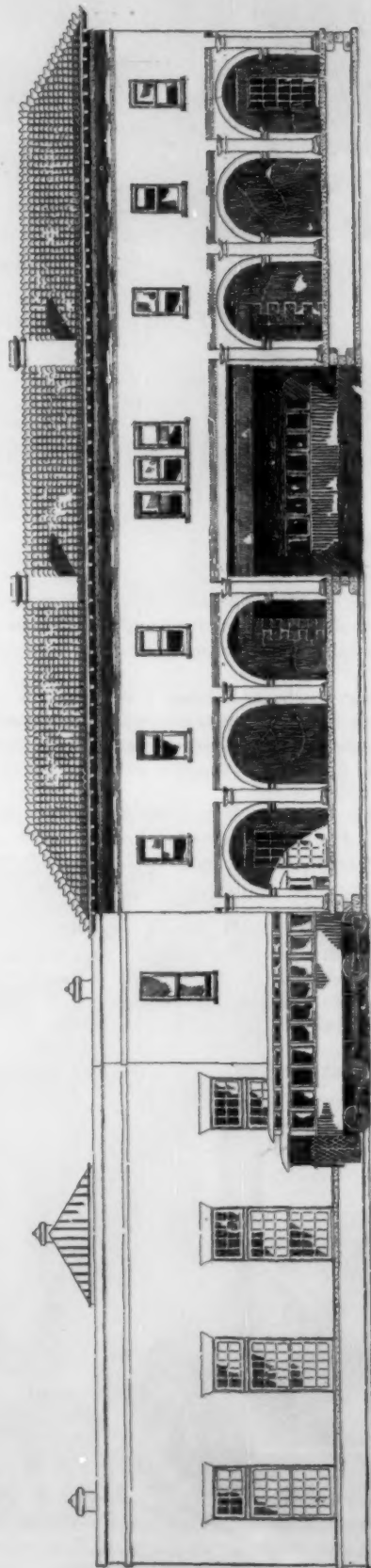
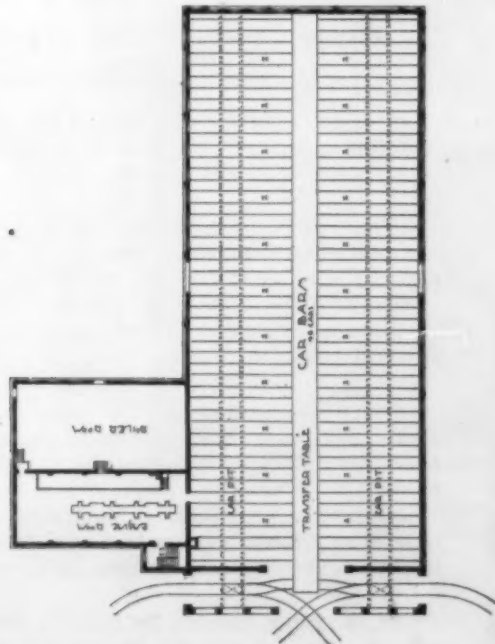
THE C. P. MERWIN BRICK COMPANY, Berlin, Conn., established in 1880, has withdrawn from the Central New England Brick Exchange Company. Theirs is one of the largest and best equipped brickmaking plants in New England, if not in the whole country. Their product is a superior quality of pallet face, building, sewer, paving, molded, and hollow brick. The plant is located on the main line of the N. Y., N. H. & H. R. R.

THE COLUMBUS BRICK AND TERRA-COTTA COMPANY are supplying their front brick on the following new contracts: Dark-gray Romans for three dwellings at Newark, N. J.; B. F. Hurd, architect; dark-buff standards for public school, No. 19, at Jersey City, N. J.; C. F. Long, architect; light-gray Romans for residence at Cincinnati, Ohio; M. H. Burton, architect; light-buff Romans for Journal Building, Dayton, Ohio; Williams & Andrews, architects; light-gray Standards and Romans for residence at Germantown, Pa.; George F. Pearson, architect.

OF new contracts the New Jersey Terra-Cotta Company has lately received: School, West New Brighton, Staten Island, N. Y.; John A. Hamilton, architect; school, No. 26, Jersey City, N. J.; H. & W. Newman, architects; grammar school, New Rochelle, N. Y.; George H. Pierce, architect.

This company is now working on the terra-cotta contracts for St. Patrick's Church, Whitinsville, Mass.; Chas. D. Maginnis, architect; apartment houses, 138th and 139th Streets and Brooks Avenue, New York City; Schickel & Ditmars, architects; residence, Seabright, N. J.; DeLemos & Cordes, architects; residence, Hillhouse Avenue, New Haven, Conn.; L. W. Robinson, architect.

A PROJECT is on foot to build a hotel, somewhat after the idea of the Mills hotel in New York, on the corner of Gainsboro and Parker Streets, Boston. The scheme is to erect a seven-story building, where comfortable quarters will be provided for young men at a moderate rate.



POWER HOUSE AND CAR BARN, ENGLEWOOD & CHICAGO STREET RAILWAY.

Reed & Stem, Architects, St. Paul, Minn.

THE CHICAGO TERRA-COTTA ROOFING AND SIDING TILE COMPANY, Chicago, report the following work under contract, for which their goods are to be used: Siding with French tile, of Malt House and Elevator, Superior Street and Center Avenue, Chicago; Beyer & Rautert, architects. French tile for store building, 63d Street and Monroe Avenue, Chicago; Cowles & Ohrenstein, architects. French tile for apartment building on Langley Avenue, Chicago; Healy & Gilbert, architects. French tile for two residences, 48th Street and St. Lawrence Avenue, Chicago; H. L. Newhouse, architect. French tile for Memorial Library, Athens, Pa., for Jesse Spalding. French tile for residence, Kewanee, Ill.; M. E. Bell, architect. French tile for Y. M. C. A. Building, at Galesburg, Ill. Spanish B tile for residence, Bloomington, Ill.; A. L. Pillsbury, architect. Inter-Ocean tile for building for J. W. Reid, London, Canada; Alf. Bodley, architect. Spanish tile for Christian Scientist Church, Kansas City, Mo.; Geo. Mathews, architect. French A tile for Soldiers' Widows' Home, Wilmington, Ill.; R. T. Newberry, architect. Spanish tile for store building of Chas. F. Young, Vinton, Ia.

For Sale.

Brick Plant and Clay Farm in Sayreville Township, Middlesex Co., N. J., on Raritan River, about 3 miles above South Amboy. 282 acres rich deposit of Terra-Cotta, Fire, Red, Blue, and Buff Brick, and Common Clays. Facilities for shipping by Water or Rail. Fully equipped Factory, Dwellings, Office, Store, etc., etc. For further particulars apply to W. C. Mason, 272 Main St., Hartford, Conn., or W. Mershon, Rahway, N. J.



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The best kind are those we furnish in Ornamental Brick of such colors as Red, Cream, Buff, Pink, Brown, and Gray. No other kind will give such soft, rich effects of harmony and simplicity, or such general good satisfaction.



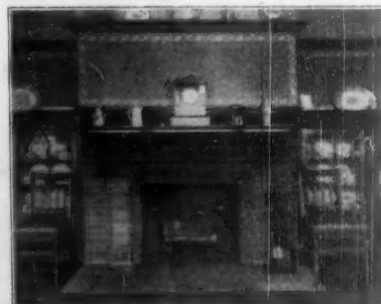
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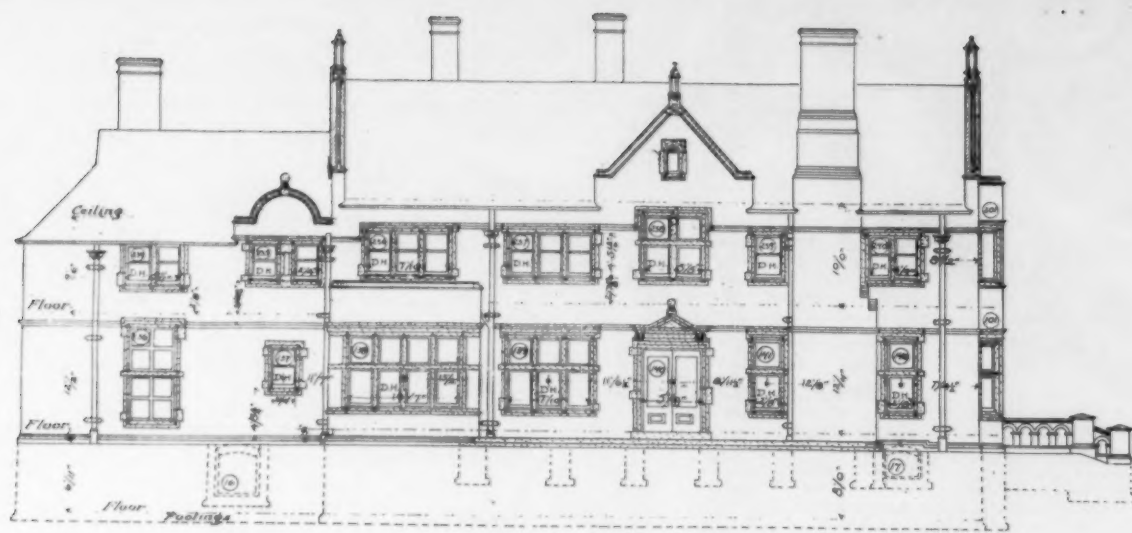
Varnish Makers and Color Grinders,

45 Broadway

New York.

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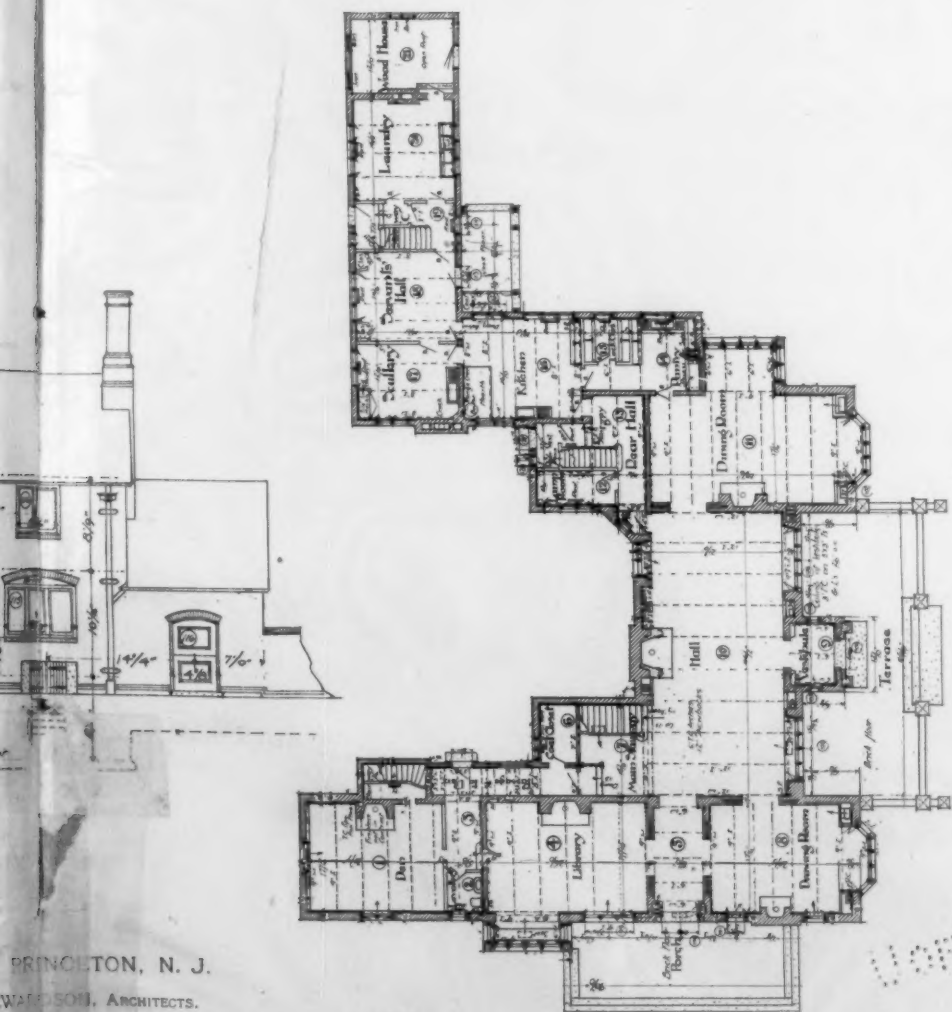
WEST.



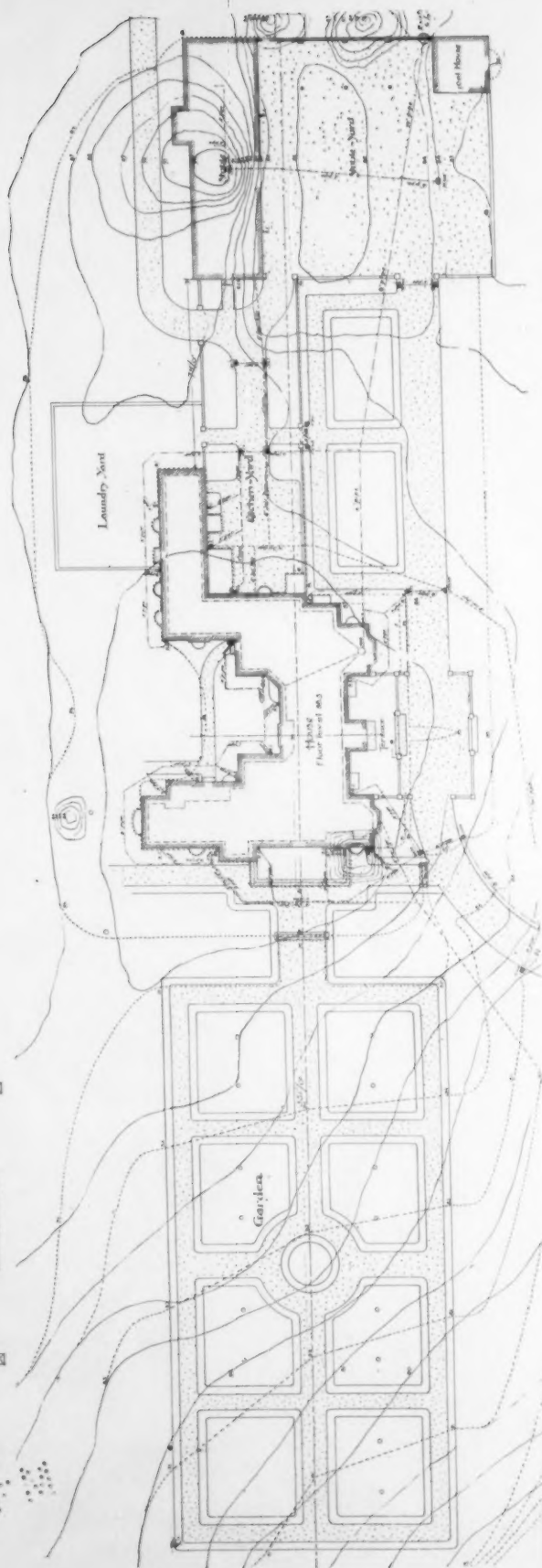
FRONT ELEVATION.



EAST.



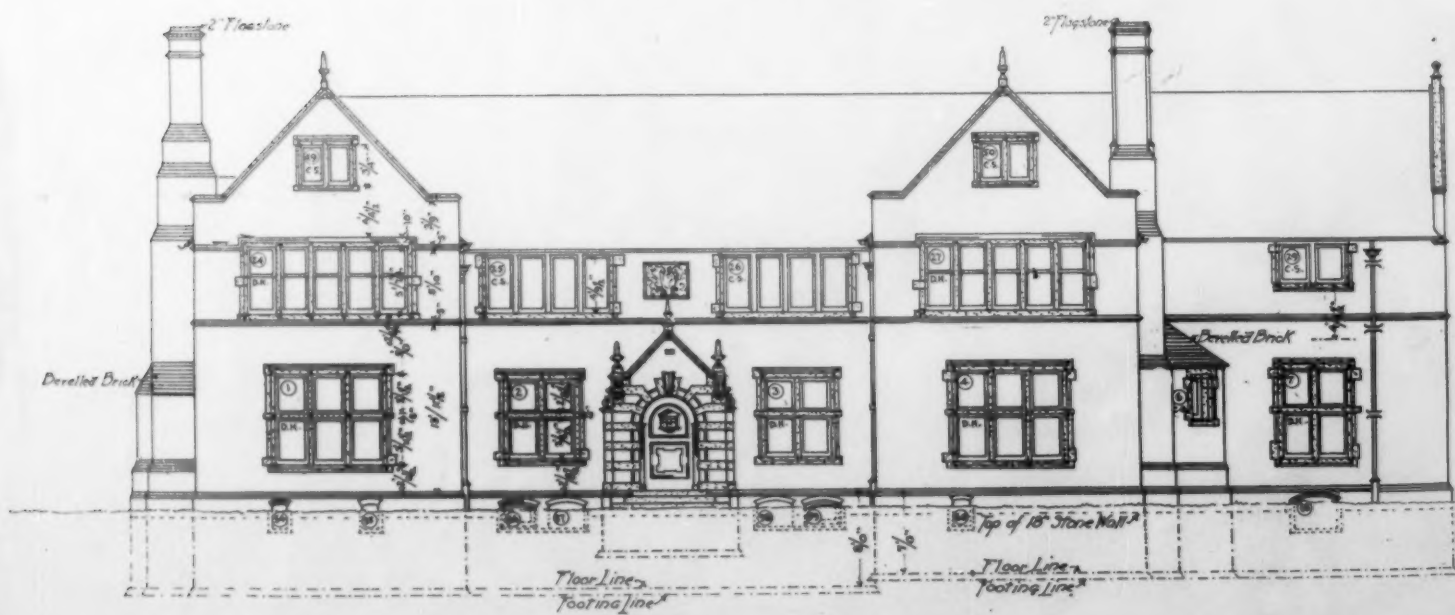
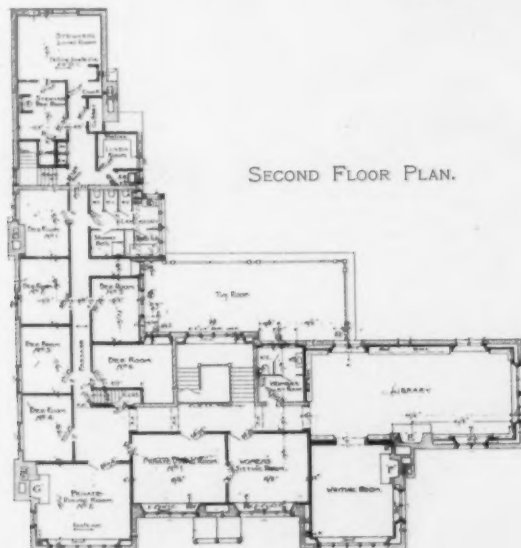
FIRST FLOOR PLAN.



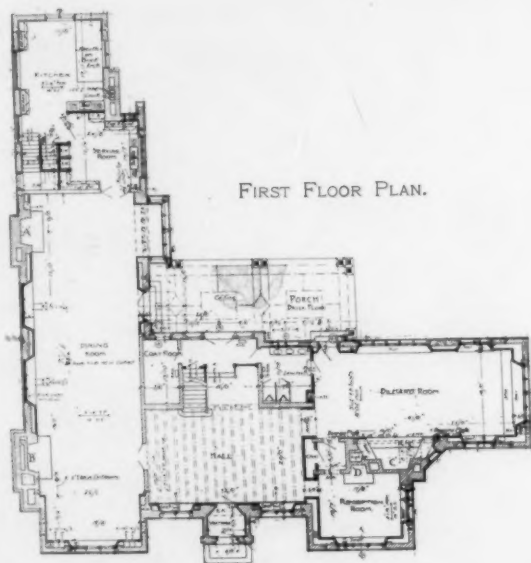
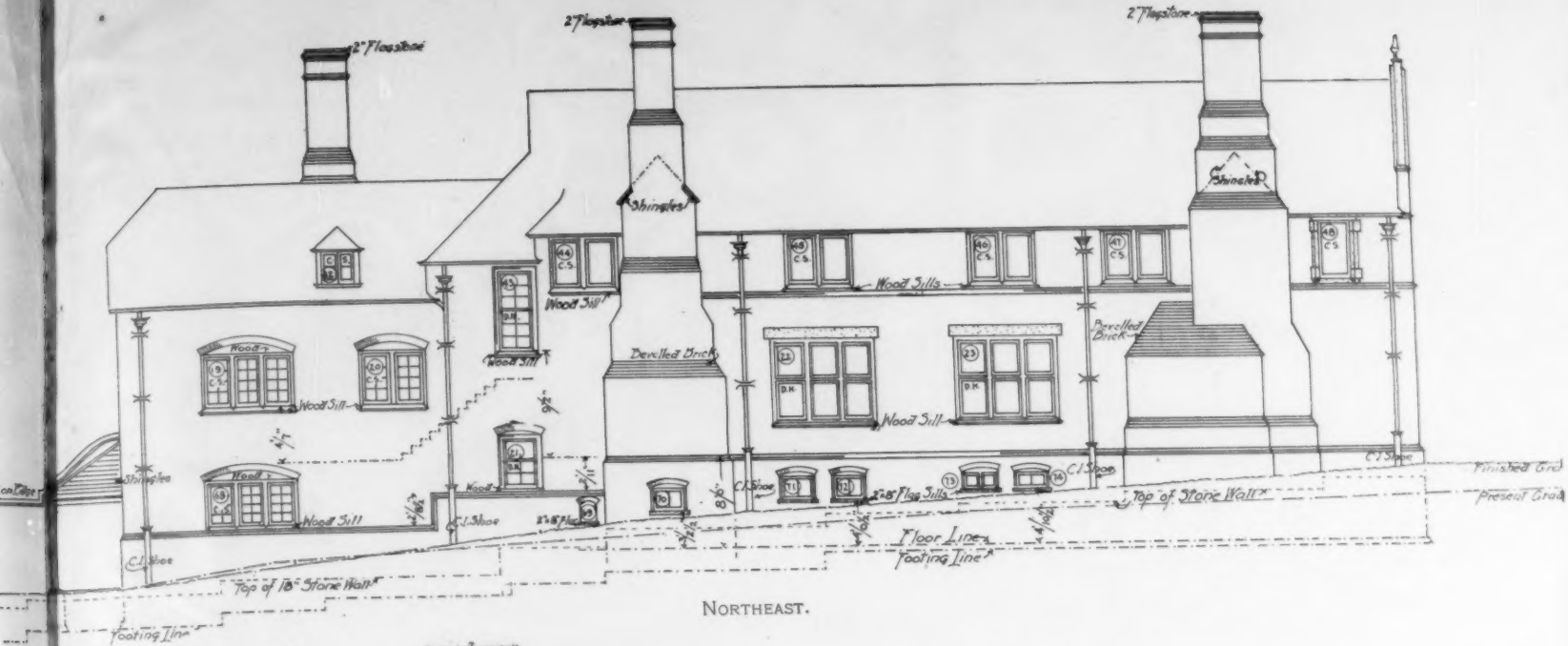
GROUND PLAN.

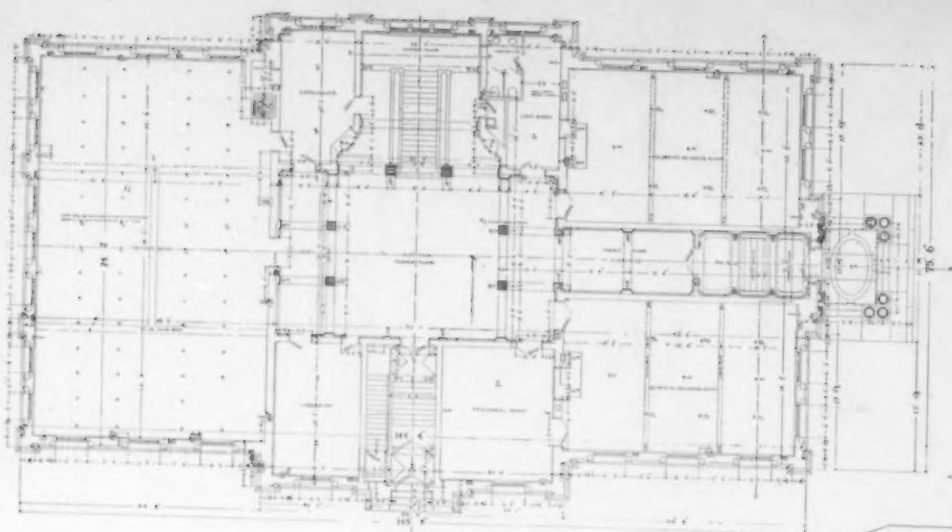


REAR.



FRONT ELEVATION.



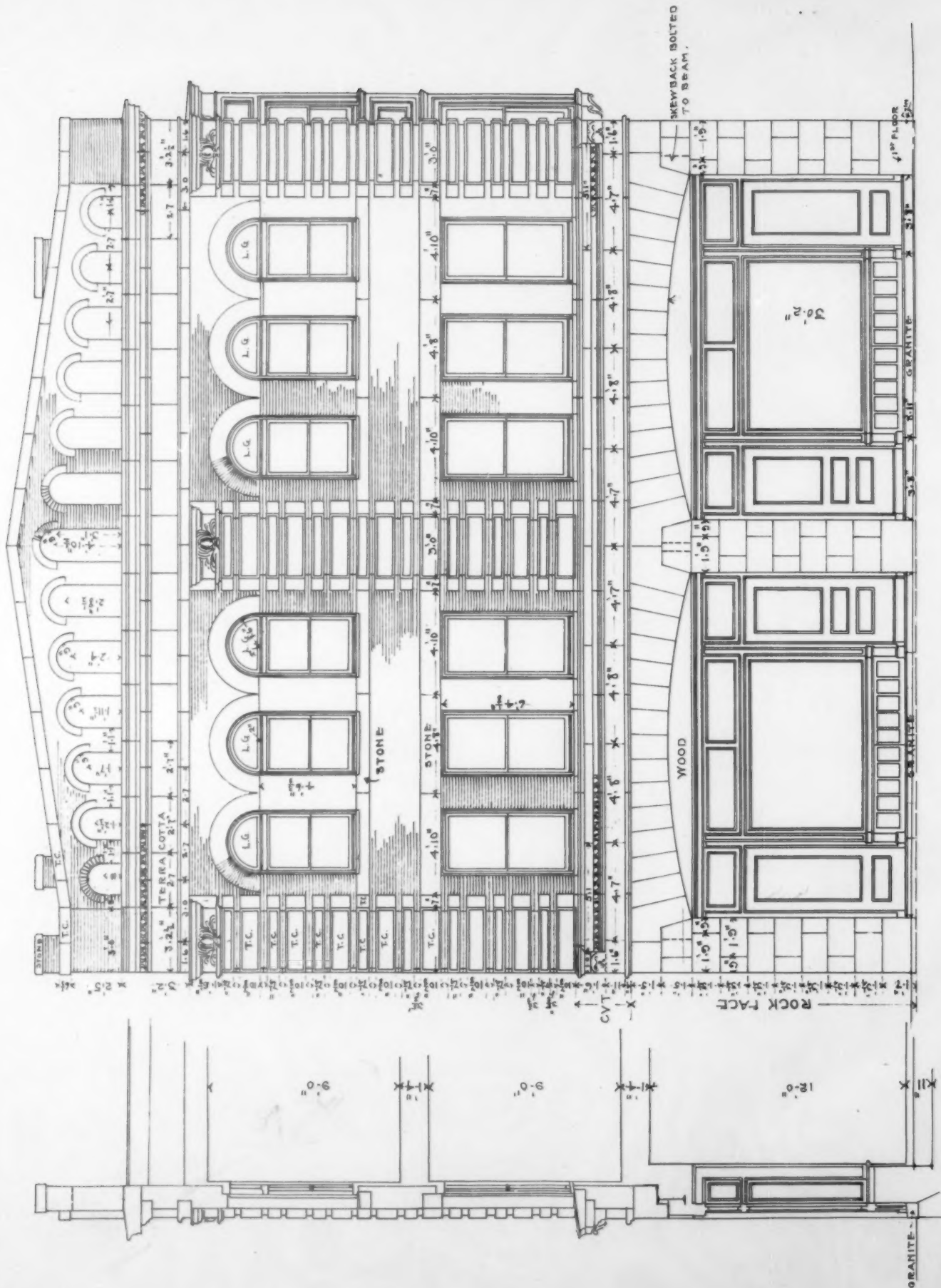


PLAN OF FIRST FLOOR





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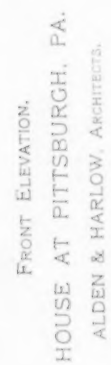


FRONT ELEVATION.

BLOCK AT PITTSBURGH, PA.

ALDEN & HARLOW, ARCHITECTS.

PLATE 8.



1704

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The Celadon Terra-Cotta Co., Ltd.

CHARLES T. HARRIS, LESSEE.

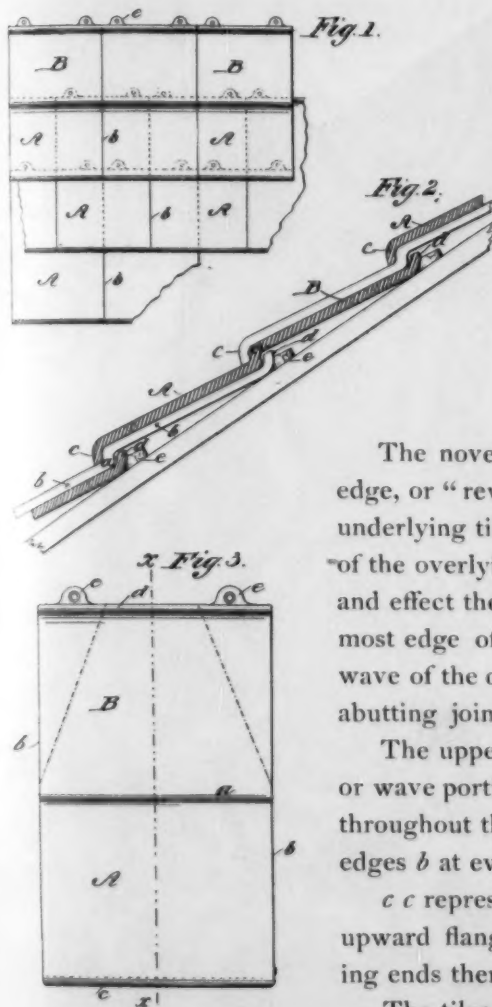
.....Manufacturers of **Artistic Roofing Tiles.**

NEW YORK OFFICE,
1123 Presbyterian Building,
156 Fifth Avenue.

ALFRED, N. Y.

(Under Babcock Patents.)

CHICAGO OFFICE,
1001 Marquette Building,
204 Dearborn Street.



ON this page are shown Improvements in Roofing and Sheathing Tiles, of which the following is a specification, reference being had to the accompanying drawings, in which—

Fig. 1 is a plan view of several tiles embodying the invention, arranged as they would lie upon a roof; Fig. 2, a vertical section taken on the line *x x*, Fig. 3, showing the tiles combined as in Fig. 1; and Fig. 3, a face view of a single tile, represented on an enlarged scale.

This improvement relates to clay or other tiles which are rectangular, or nearly so, in form, and abut at the sides in continuous rows lengthwise of the roof, being laid so as to "break" joints (shingle fashion) between consecutive rows.

The novelty consists in applying to this character of tile a downturned flange at its lower edge, or "reveal," giving a high relief to the same, and conforming the adjacent portion of the underlying tile with an upward bend or wave near its middle, which fits the downturned flange of the overlying tile so as to bring every part of the adjacent lapping surfaces closely together and effect the sealing of the abutting joints. An upturned flange is also provided to the uppermost edge of the tile, which flange interlocks with and beneath the adjacent upward bend or wave of the overlying tiles to prevent penetration of wind, rain, or dust between the part of the abutting joints that intersect said upward bend or wave of the overlying tiles.

The upper and lower portions A and B of the tile lie in distinct planes, joined by the offset or wave portion *a*. When the tiles are combined a double thickness of the material is formed throughout the roof, thereby closing the space beneath the abutting joints between the plain edges *b* at every part.

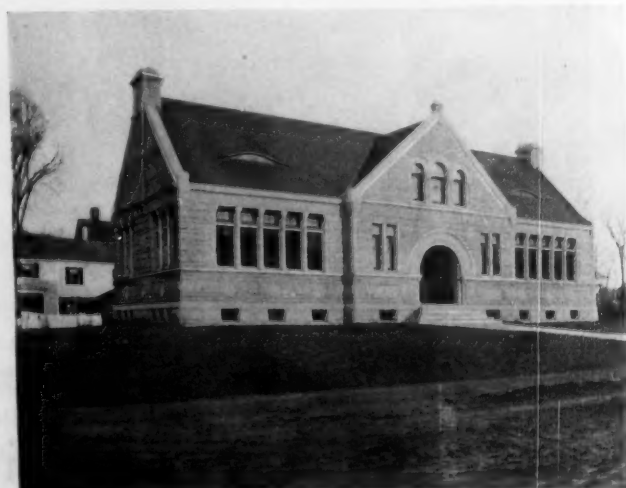
c c represent the downward flanges, terminating the exposed surfaces of the tiles, and *d d* the upward flanges, terminating the underlying ends thereof.

The tiles may be lightened by cutting off portions of the upper half, as shown in dotted lines in Fig. 3, without interfering with their tightness.

The tiles may be secured to the substructure by any suitable mode or device. We have illustrated that of providing ears *e*, having perforations for the reception of nails.

By the interlocking of the flanges at the ends with the wave in the center, the tiles are rendered mutually supporting, so that should the fastening of any one become loosened it cannot fall and endanger persons below, as is the case with common shingle-tile and slate.

The accompanying cut of the LITHGOW MEMORIAL LIBRARY, AUGUSTA, ME., shows a building covered with these tiles.



LITHGOW MEMORIAL LIBRARY,
AUGUSTA, ME.



THE ASTORIA HOTEL, FIFTH AVENUE AND THIRTY-FOURTH STREET, NEW YORK CITY. H. J. HARDENBERGH, ARCHT. DRY.

Attention is called to the fact that some 61,000 cu. ft. of terra-cotta are used on this building and the Astor Court Building, seen in the distance. This includes the work made for the interior, on the ground and first floors. The total weight was about 2,300 tons, which is equal to 600 truck loads of 7,333 lbs. each.

ARCHITECTURAL TERRA-COTTA EXECUTED BY

The New York Architectural Terra-Cotta Company,

38 PARK ROW, NEW YORK CITY.

PHILADELPHIA.

BOSTON.